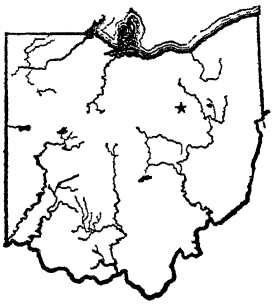
COUNTY EXPERIMENT FARMS IN OHIO

ANNUAL REPORTS FOR 1916 AND 1917

OHIO
Agricultural Experiment Station

WOOSTER, OHIO, U. S. A., MAY, 1918

BULLETIN 323



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Southwestern Test-Farm, Germantown
HENRY M. WACHTER, *Superintendent*

Southeastern Test-Farm, Carpenter
S. C. HARTMAN, *Superintendent*

Northwestern Test-Farm, Findlay
JOHN A. SUTTON, *Superintendent*

COUNTY EXPERIMENT FARMS

Miami Co. Experiment Farm, Troy
Paulding Co. Experiment Farm, Paulding
Madison Co. Experiment Farm, London
R. R. BARKER, *Supt.*, Wooster

Clermont Co. Experiment Farm, Owensville
Hamilton Co. Experiment Farm, Mt. Healthy
W. J. SMITH, *Supt.*, Mt. Healthy

Washington Co. Experiment Farm, Fleming
Washington Co. Truck Experiment Farm, Marietta
Belmont Co. Experiment Farm, St. Clairsville
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Trumbull Co. Experiment Farm, Cortland
M. O. BUGBY, *Supt.*, Canfield

STATE FORESTS

Waterloo State Forest, New Marshfield
Dean State Forest, Steece

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[1]In cooperation with the College of Agriculture, Ohio State University, Columbus.
[2]On leave of absence in military service.
[3]In cooperation with the U. S. Department of Agriculture.

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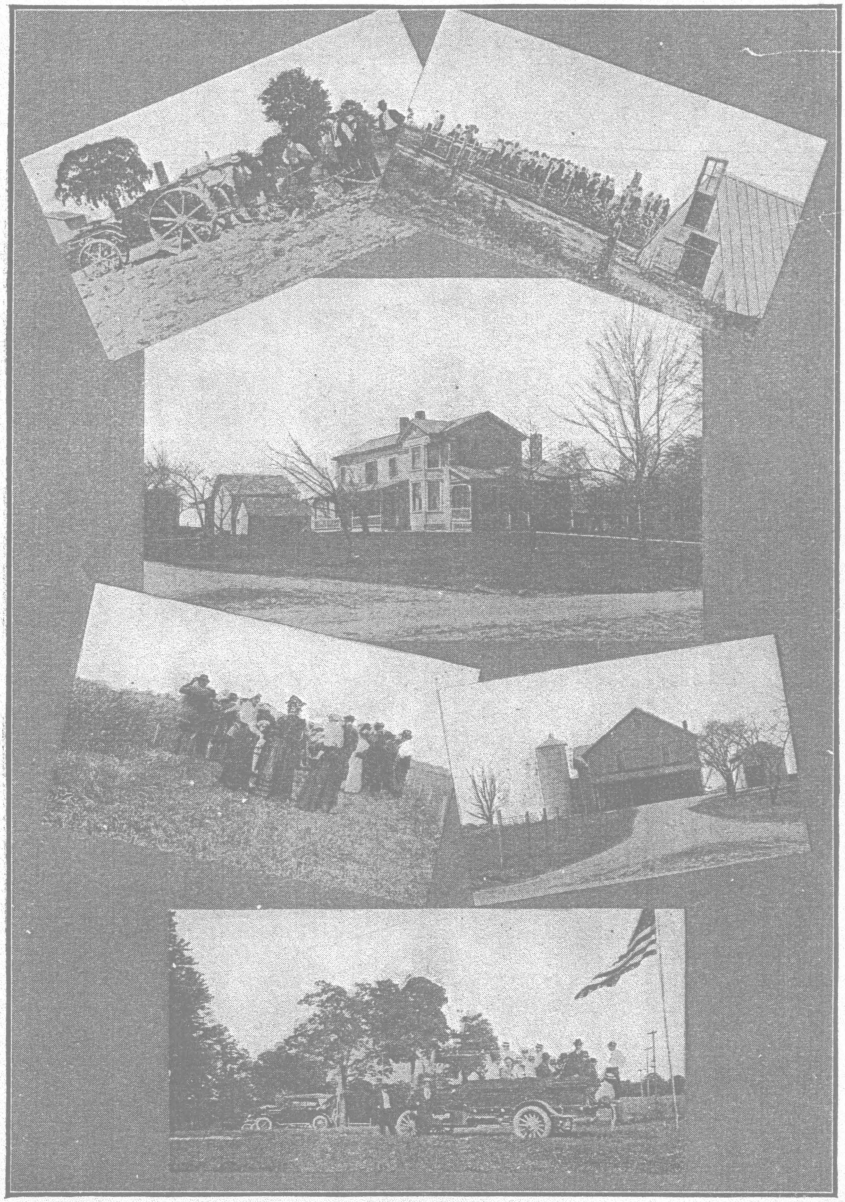


Scenes on the county experiment farms

COUNTY EXPERIMENT FARMS IN OHIO

ORGANIZATION

For convenience of administration the county experiment farms in Ohio are organized in the Department of Farm Management of the Experiment Station. The chief of that department visits the different farms at frequent intervals and has full authority in their management, under the director of the Station.

In counties having an agricultural agent, this person acted as local superintendent of the county experiment farm previous to July 1, 1917, under a mutual agreement between the Experiment Station and the College of Agriculture, the Experiment Station paying a part of his salary in consideration of this service. In some counties the agricultural agent lived on the experiment farm, using that as his headquarters, and in others he lived at the county seat, visiting the farm frequently. The immediate management of the farms is in the hands of working foremen, who are expected to lead in the work and to execute the work assigned to their respective farms.

The county agents were released from the supervision of the experiment farms July 1, 1917, in order that they might devote their entire time to the agency work, and since then the chief of the Department of Farm Management has been assisted by several farm superintendents, each of whom has had two or more county or district experiment farms under his charge.

The work of the county experiment farm is planned jointly by the chief of the Department of Farm Management and the chiefs of the several other departments of the Experiment Station. Variety and cultural tests are undertaken on the approval of the chief in agronomy; those having to do with the production of meat, wool and poultry on that of the chief in animal husbandry, and similarly with other lines of work. Under this system each county experiment farm becomes in fact an integral part of the State Agricultural Experiment Station and a participant in its work.

The annual results of the work of all the county experiment farms are brought together here in a single bulletin in order to facilitate comparisons. No single farm can adequately represent all the soils of a county, and it will often happen that a farm located in some other county will more fully meet the requirements of a particular farmer than will the one in his own county.

Previous publications in this series have been:

Bulletin
241 (1912)—County Experiment Farms in Ohio (First Report).
256 (1913)—Miami County Experiment Farm, Second Annual Report.
258 (1913)—Paulding County Experiment Farm, Second Annual Report.
272 (1914)—Hamilton County Experiment Farm, Second Annual Report.
273 (1914)—Paulding County Experiment Farm, Third Annual Report.
274 (1914)—Miami County Experiment Farm, Third Annual Report.
275 (1914)—Clermont County Experiment Farm, Second Annual Report.
286 (1915)—County Experiment Farms in Ohio, Annual Reports for 1914.
303 (1916)—County Experiment Farms in Ohio, Annual Reports for 1915.

The district experiment farms receive no support from the counties in which they are located, but are regarded simply as outlying fields of the main station, and most of their work is reported in connection with similar work of the main station. Separate reports have been made upon the work of the Southwestern Test Farm (Germantown) in Bulletins 156, 206, 238, 239, 285 and Circulars 59 and 156, and upon that of the Northeastern Test Farm (Strongsville) in Bulletin 260 and Circular 144.

THE WORK OF THE COUNTY EXPERIMENT FARM

C. W. MONTGOMERY

The first paragraph of the law authorizing the establishment of county experiment farms in Ohio states that the object of these farms shall be "to demonstrate the practical application under local conditions of the results of the investigations of the Ohio Agricultural Experiment Station and for the purpose of increasing the effectiveness of the agriculture of the various counties of the State."

How may a county experiment farm demonstrate results and increase the effectiveness of the agriculture of the county? A few examples taken from the fertility and variety tests of the Ohio Experiment Station will illustrate the point.

The Ohio Agricultural Experiment Station since its establishment in Wayne County has conducted experiments with fertilizers and manure for the purpose of increasing crop yields profitably, with the results that in a 5-year rotation an application of 80 pounds of acid phosphate on corn has increased the yield 7.6 bushels per acre as a 24-year average; 8 tons of manure has increased the yield of corn 24.95 bushels per acre; but it cannot be said that the same results would be obtained in all counties of the State, so that it is necessary that these tests be conducted on all types of soil and under all climatic conditions.

So far, applications of 200 pounds per acre of acid phosphate have increased the yields of corn on all the county experiment farms save one—Paulding County. These increases have ranged from as

low as 3.30 bushels to a maximum of 11.04 bushels per acre. Increased crop yields in Paulding County depend upon drainage and tillage rather than fertilization while both drainage and fertilization are highly essential in Clermont County.

Variety tests and selection work with cereals at Wooster have shown that certain varieties greatly out-yield others and certain strains, or selections, yield better than the original variety; but cooperative work with farmers has shown that the best-yielding varieties or strains vary with locality and that 1 year tests are insufficient to determine them. A county experiment farm affords opportunity for extended tests which establish the best-yielding variety or strain for its particular part of the State, as well as the best practices in fertility maintenance.

The line of animal husbandry work that shall be taken up depends largely upon the topography, climate, soil type, markets and roads, and availability of labor.

Corn is the dominant cultivated crop throughout Ohio and, as demonstrated at Wooster, in feeding cattle and probably sheep also, the greatest acre-return is obtained through the silo.

Corn silage over much of northeastern Ohio is often highly acid owing to failure of the corn crop to mature. Sheep do not seem to relish this acid silage while cows take to it more kindly. Moreover, the rather heavy and moist soils of this region are less suited to sheep than the drier soils of southeastern Ohio. Hence, natural conditions would seem to favor dairying in the northeastern and sheep husbandry in the southeastern part of the State. However, it sometimes happens that artificial conditions dominate the natural; for instance, dogs are so numerous in some parts of the hilly sections of Ohio that profitable keeping of sheep is extremely uncertain.

Over much of western Ohio corn and other crops do well, so that as far as the crops are concerned any line of animal husbandry might be undertaken; however, other problems come in that must be studied. The availability of labor is a problem common to all sections of the country. On the Miami County and on the Paulding County Experiment Farms hog work has been put in with a view to hogging down crops economically and with a minimum of labor. While at Miami and Paulding the hogging-down system is used, the same crops are not grown on both farms, for the reason that on the Paulding soil fall-sown crops are frequently winter-killed and hence oats, a spring-planted crop, are put in. The oats, however, are not harvested by hogs, this crop not being considered a profitable hog feed.

Crops cannot be grown for hogging down all the year and so a cropping system must be planned that will furnish extra feed, which must be largely corn. At Paulding we have introduced a 2-year rotation, corn and oats, clover being sown in the oats for a manurial crop, the corn being husked on the stalk and the stalks going back to the land. It is not certain with this intensive cropping system whether the fertility of the land can be maintained at the Miami County Experiment Farm, and hence a rotation of corn, corn, oats or wheat and clover is put in, one-half of the corn stubble going to wheat and one-half to oats. This rotation gives half the land to corn each year, the same as at Paulding, but allows the clover crop to mature fully and affords a better distribution of labor.

At the main station rotations are studied more to note the effect one crop has on the succeeding one, or the effect on the fertility of the land, than to note their practical application to the various sections of the State or to how they fit into an animal husbandry system; for instance, 4-year rotation of corn, soybeans, wheat and clover at Wooster is found to increase crop yields, other factors being equal; but when we come to apply it to the different sections of the State, in some counties if the soybeans are grown for beans they do not come off in time to get the wheat in early enough for best yields, while if they are grown for hay the rotation makes too much roughage in proportion to the grain grown.

In general on heavy land it is not best to practice a cropping system that involves plowing the land every year; but since in dairy farming corn must largely go into the silo and corn is heavy to handle, it is suggested that land be selected near the silo and devoted to the production of cow feed. Corn may be followed by rye as a cover crop, followed by soybeans, rather heavy applications of phosphated manure being given to the land for corn. The soybean hay thus produced will hardly be sufficient to supplement the silage properly and it does not furnish bedding, so that on the more distant fields a longer rotation may be followed, such as corn, wheat or oats, and clover, the corn being used for feeding the equipment livestock and enriching the silage, the straw for bedding and clover hay to help out the soybean hay. As the expense of fertilizing the land with farm manure is mostly in the hauling, fertilizers should be used on the distant fields and the farm manure largely used on fields near the barn.

A county experiment farm may therefore increase the effectiveness of the agriculture of a county by demonstrating the best method of maintaining and increasing crop production; by discovering the line of animal husbandry best adapted to that locality, and by practicing the cropping system best fitted to that line of work.

BULLETIN

OF THE

Ohio Agricultural Experiment Station

NUMBER 323 MAY, 1918

COUNTY EXPERIMENT FARMS IN OHIO

PART I

THE MIAMI COUNTY EXPERIMENT FARM

SIXTH AND SEVENTH ANNUAL REPORTS, FOR 1916 AND 1917

GEORGE R. EASTWOOD AND FRANK M LUTTS, SUPERINTENDENTS
PERLE A. JONES, FOREMAN

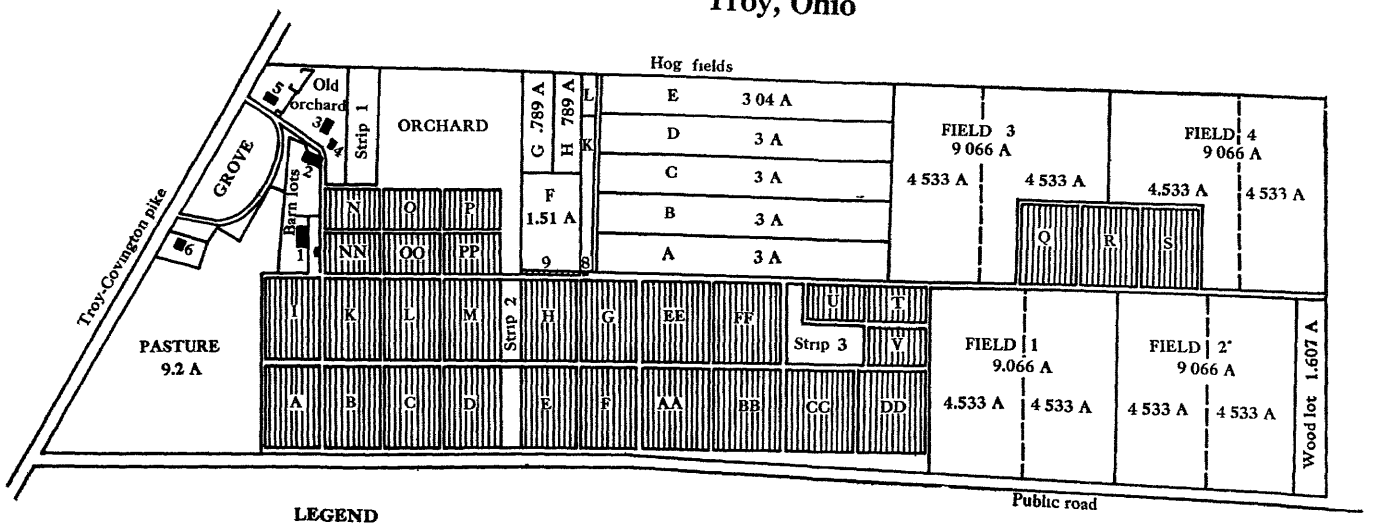
PERSONNEL

George R. Eastwood resigned the superintendence of this farm July 1, 1917, and was succeeded by Frank M. Lutts, who resigned March 1, 1918, and was succeeded by R. R. Barker.

Residence of farm foreman, Miami County Experiment Farm

MIAMI COUNTY EXPERIMENT FARM

Troy, Ohio



LEGEND

Blocks A, B, C, D, Fertility test, Rotation I
Blocks E, F, G, H, Fertility test, Rotation II } Plots 1-10 acre
Blocks I, K, L, M, Fertility test, Rotation III
Block AA Alfalfa
Blocks CC, DD, EE, FF, Cereal variety test
Blocks N, O, P, Tobacco Rotation (IV) Fertility test
Blocks NN, OO, PP, Tobacco Rotation Variety test } Plots 1-20 acre
Blocks T, U, V, Potato Rotation (VI) Fertility test
Blocks Q, R, S, Cereal 3-year rotation (V) Fertility test Plots 1-10 acre
Block BB, Rotation test

1-10 acre plots 272 1-4 ft. x 16 ft.
1-20 acre plots 136 1-8 ft. x 16 ft.
Paths 3 ft. wide
T, U, V, are 1-23 acre
118.36 ft. x 16 ft. 3 ft. paths
1 New barn, 2 Old barn, 3 Corn crib, 4 Tool shed, 5 Main house, 6 Tenant house.

W
E

THE AGRICULTURE OF MIAMI COUNTY

Geology.—Miami County lies upon limestones, chiefly belonging to the Niagara and Clinton groups, with a small area of the Richmond limestones and shales in the southeastern corner. Everywhere these rocks have been covered with a sheet of glacial drift, which has weathered into a soil so well stored originally with all the elements of fertility that Miami County has been celebrated for its productiveness.

Topography and soil.—The topography and soil of Miami County are characteristic of large areas in central and western Ohio. The land lies as a nearly flat plain, the soil of the slight elevations being a yellowish or grayish yellow clay loam, or silty clay loam, of the Miami series, and that of the depressions the brown to black clay loam of the Clyde series. The difference in color is due to an accumulation of organic matter washed into the depressions from the higher lands around. Both the yellow and the black soil owe their origin to the grinding up of the same rocks, over which the ancient glaciers traveled in their southward course, mingling with the limestone detritus of the southern portion some granitic and shaly material carried down from the North. The difference in their present character is due to the action of water in removing the lighter materials from the higher levels to the lower, and to the difference in the vegetation consequent upon the differences in water supply.

Agriculture.—The statistics of crop production for Miami County show that corn has been the principal crop, occupying nearly as many acres as all the small grains combined, while the relatively small areas given to meadows and clover indicate that much of the land has been given to continuous cropping with the cereal grains without that alternation with leguminous crops which is essential to the highest productiveness.

The livestock statistics show a steady reduction in relative number from the equivalent of 154 cattle per thousand acres during the eighties to 102 during the last decade, this equivalent being arrived at by assuming 10 hogs or sheep as equivalent to one horse or cow for manure production.

Comparatively little use has been made of commercial fertilzers in Miami Conuty until very recent years, the expenditure for this purpose averaging but $20,000 annually during the decade 1900-1909 as against four times that amount in Wayne County, but the experiments now under way on the Miami County Farm show that this soil is ready to respond profitably to applications of phosphorus.

MIAMI COUNTY STATISTICS

POPULATION (U. S. Census)

	1870	1880	1890	1900	1910
Total	32,740	36,158	39,754	43,105	45,047
White	31,691	34,984	38,575	41,945	43,936
Negro	1,049	1,172	1,177	1,153	1,109
Foreign born	2,509	2,177	2,219	1,799	1,482
Rural	.....	.....	.....	25,052	25,537
Urban	.....	.....	.....	18,053	19,510

FARMS (U. S. Census)

	1880	1890	1900	1910
Approximate land area—acres	.....	.....	.....	261120
Land in farms—acres	241052	233642	249411	247456
Improved land in farms—acres	189369	202197	219112	221371
Woodland in farms—acres	48639	} 31445	30299	} 17163
Other unimproved land in farms—acres	3044	}		} 8922
Total number of farms—number	2629	2706	2989	3328
Area of average farm—acres	91.7	86.3	83.4	74.4
Improved land per farm—acres	72.0	74.7	73.3	66.5
Value of all property per farm—dollars	7115	6567	5450	8496
Value of land and buildings per farm—dollars	6483	5978	4866	7606
Value of land and buildings per acre—dollars	70.70	69.27	58.35	102.23

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses	8,270	9,451	9,958	11,097	10,922	8,434
Cattle	16,001	15,097	15,475	16,489	12,875	12,464
Sheep	20,762	19,278	10,798	10,415	5,988	2,197
Hogs	33,615	29,019	27,121	19,304	15,578	14,706
Cattle equivalent total	29.709	29.378	29.225	30.558	25.954	22.588
Per 1,000 acres	.....	.....	154	151	118	102

FARM CROPS, 10-year average production (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn—acres	38483	38662	48500	50084	47767	54290
Bushels	1272145	1336115	1881500	2022903	1789568	2372410
Bushels per acre	33.1	34.3	38.8	40.4	37.4	43.7
Oats—acres	8543	9906	11920	9278	13424	23040
Bushels	158799	287920	337545	302285	436995	826160
Bushels per acre	18.6	29.1	28.3	32.8	32.6	35.9
Wheat—acres	27392	35784	36044	48594	47353	38251
Bushels	419495	507551	544324	793462	787992	596457
Bushels per acre	15.3	14.2	15.1	16.3	16.6	15.4
Rye—acres	1615	696	490	201	447	269
Bushels	15681	8819	5911	2639	4976	3536
Bushels per acre	9.7	12.7	12.1	13.1	11.1	13.1
Meadows—acres	8724	6868	5913	6697	9691	10294
Tons	9548	7297	6386	8293	12684	13174
Tons per acre	1.09	1.06	1.08	1.24	1.22	1.28
Clover—acres	.....	7284	9093	15077	15505	13228
Tons	.....	3401	5155	9468	10437	11321
Tons per acre	.....	.47	.57	.63	.72	.85
Potatoes—acres	.....	685	1105	1156	1611	1148
Bushels	.....	47923	78987	96461	102946	92060
Bushels per acre	.....	70.0	71.4	83.4	63.9	80.2
Orchards—acres	.....	3376	3806	2350	2200	1455
Apples—Bushels	.....	91930	112904	65083	34483	21510

INVENTORY AND CLASSIFICATION OF OPERATING EQUIPMENT
March 1, 1917

Land: 123 acres—original cost (including buildings)		$18,505.00
Operating equipment:		
Livestock: horses $1,600; hogs $910	$2,510.00	
Machinery and tools	1,137.00	
Horse equipment—harness, etc	91.00	
Hog equipment: sunshades $30; feed house $75; "A" type houses $100; crates $15; small items $17	237.00	
Feeds: hay $200; straw $120; alfalfa $12; corn $630; wheat $162; oats $220; tankage $25; soybeans $50	1,419.00	
Seeds: clover $30; timothy $10; soybeans $100	140.00	
Fertilizer and limestone	101.00	
Spray material	7.00	
Investment exclusive of permanent improvements		5,642.00
Total investment		$24,147.00

RECEIPTS AND EXPENDITURES, 1916

RECEIPTS

From county treasury		$1,851.71
From farm sales:		
Livestock—horses $100; cattle $844.65; hogs $1,626.32	$2,570.97	
Grain and beans—wheat $69.70; oats $187.68; soybeans $155; corn $3.50	415.88	
Forage crops—hay $124.69; fodder $0.25	124.94	
Tobacco	63.55	
Unclassified sales	16.60	
		3,191.94
Total receipts		$5,043.65

EXPENDITURES

For labor			$1,337.41
For current expenses—seeds, etc. $100.55; fertilizer, lime, etc. $167.40; spray materials $10.10; blacksmithing and repairs $55.65; fuel and light $30.15; power maintenance $12.17; miscellaneous hardware $13.86; containers $17.45; insurance $25.20; publicity $25.20; telephone and telegraph $26.72; transportation $73.85; postage $5; office furniture $7.39			570.69
For machinery and tools			563.53
For permanent improvement:			
Buildings	$69.56		
Building material and construction—lumber $53.28; painting $6.45	59.73		
		$129.29	
Fences		3.50	
			132.79
For livestock:			
Purchases—horses $1,184.80; hogs $15		1,199.80	
Maintenance—feeds $1,126.70; veterinary, medicine, etc. $77.10; livestock fees $6		1,209.80	
			2,409.60
Total expenditures			5,014.02
Balance in county treasury February 28, 1917			29.63
Total			$5,043.65

CROP AND LABOR STATISTICS, 1916

Area of farm, 123 acres
Area cultivated, 91.36 acres
(including orchard, 4.34 acres)
Permanent pasture, 11.7 acres
Woodlot, 1.61 acres
Farm roads, 5.83 acres
Public road, 5.25 acres
Yards and grove, 7.25 acres

Crop	Number of plots	Total acreage	Total yield	Yield per acre
PLOT WORK		*Acres*	*Pounds*	
Corn	65	6.5	22,354	49.13 bu.
Oats	32	3.1	5,187	52.29 bu.
Barley	1	.1	188.5	39.27 bu.
Emmer	1	.1	192	60.00 bu.
Soybeans	21	2.1	2,215.5	17.58 bu.
Cowpeas	1	.1	19.5	3.25 bu.
Wheat	82	6.08	7,162.5	19.63 bu.
Hay	62	6.175	30,130	2.44 tons
Alfalfa	12	1.425	3,635	1.28 tons
Potatoes	10	.435	147.75	5.66 bu.
Tobacco	24	1.0	1,684.25	1,684.25 lb.
Timothy (seed)	10	1.1875	380	7.11 bu.
Total	321	28.3		
FIELD WORK				
Corn		21.03	72,163.3	49.02 bu.
Oats		9.0	12,075	41.93 bu.
Soybeans		4.25	1,872	7.34 bu.
Wheat		4.5	3,162	11.72 bu.
Rye		3.0	960	5.71 bu.
Hay		10.28	53,855	2.62 tons
Clover (seed)		6.6	155	.39 bu.
Timothy (seed)		1.52	313	4.58 bu.
Unharvested area:				
Alfalfa		1.29	Seeded Aug. 22, 1916	
Clover		3.0	Hogged off	
Orchard		4.34	No report	
Total		63.36		
Grand total		97.02		

	Corn Bu.	Oats Bu.	Soybeans Bu.	Wheat Bu.	Hay Tons	Potatoes Bu.
Highest-yielding plots per acre	66.71	75.94	22.58	35.83	3.83	6.61
Lowest-yielding plots per acre	19.5	32.34	13.83	5.37	1 75	4.41

Number of work horses used in 1916 6
Number crop acres per work horse 16.17
Number man hours per year (March 1, 1916 to February 28, 1917 inclusive) 7,049¼
Number horse hours per year (March 1, 1916 to February 28, 1917 inclusive) 5,174½

THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Six rotations are in progress on the Miami County Experiment Farm; namely:

Rotation I: Corn, oats, wheat, clover.
Rotation II: Corn, soybeans, wheat, clover.
Rotation III: Corn, corn, oats, clover.
Rotation IV: Tobacco, wheat, clover.
Rotation V: Corn, wheat, clover.
Rotation VI: Potatoes, wheat, clover.

Rotations I to III were begun in 1911; Rotation IV was started in 1912, Rotation V in 1915, and Rotation VI in 1916. All these rotations are so arranged that each crop is grown every season.

In Diagram II is shown the arrangement of the plots in Rotations I, II and III. Rotations IV, V and VI each comprise three 10-plot blocks. The plan of fertilizing is shown in Tables 1 and 2.

THE 4-YEAR CEREAL ROTATIONS

The fertility plots in these rotations were located on land which includes both types of soil, the yellow and the black, which shade into each other in such a manner that it is difficult to say just where one type ends and the other begins. The difficulty in conducting a reliable experiment on such land was fully recognized, but an experiment covering both types of soil with their intermediate gradations, if it could be successfully carried out, would be of greater value to the average Miami County farmer than one limited to either type alone.

In the field experiments of the Ohio Experiment Station the standard plot is 16 feet wide by 272⅓ feet long, containing one-tenth of an acre, these dimensions being adhered to wherever the conditions will permit, which was the case on the Miami County Experiment Farm. The plots are separated by paths 2 or 3 feet wide and are arranged in blocks of 10 plots, a roadway being left on the four sides of each block. In the fertility experiments every third plot is left continuously without either manure or fertilizer, and in computing results the two fertilized plots are compared with the unfertilized plots between which they lie on the assumption that if Plots 1 and 4, unfertilized, yield, say 30 and 33 bushels per acre, the probable unfertilized yields of Plots 2 and 3 would have been 31 and 32 bushels. Of course, the gradations in natural fertility are not always so uniform as this, but experience has shown that the error resulting from this method of calculation is usually smaller than from a mere striking of general averages.

TABLE 1.—PLAN OF FERTILIZING, MIAMI COUNTY EXPERIMENT FARM

Pounds of fertilizing materials per acre for each crop

Plot	Acid phosphate	Muriate potash	Nitrate soda	Powdered limestone	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
	Rotation I: Corn-oats-wheat-clover									
	On corn				On oats			On wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	200	50	50	*4,000	100	20	30	200	20	80
7										
8	Manure, 8 tons							200	50	50
9	Manure, 8 tons, phosphated†							200	50	50
10										
	Rotation II: Corn-soybeans-wheat-clover									
	On corn				On soybeans			On wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	130	50	20		70	20	10	160	20	20
7										
8	160	20	20		100			170		30
9	160	20	20	‡	100			170		30
10										
	Rotation III: Corn-corn-oats-clover									
	On corn 1st				On corn 2d			On oats		
1										
2	200				200			100		
3	200	50			200	20		100	20	
4										
5	200	50	50		200	20	80	100	20	30
6	200	50	50	*4,000	200	20	80	100	20	30
7										
8	Manure, 8 tons				200	50	50			
9	Manure, 8 tons phosphated†				200	50	50			
10										
	Rotation IV: Tobacco-wheat-clover				Rotation V: Corn-wheat-clover					
	Fertilizer all on tobacco				On corn			On wheat		
1										
2	480				200			200		
3	480	180			200	50		200	20	
4										
5	480	180	240		200	50	50	200	20	80
6	480	180	240	2,000	200	50	§50	200	20	80
7										
8	240	90	120		Manure, 8 tons			200	50	50
9	Manure, 10 tons, phosphated†				Manure, 8 tons, phos.†			200	50	50
10										

*2,000 pounds in 1912. †40 pounds acid phosphate per ton of manure. ‡Catch crop to follow corn.
§4,000 pounds of limestone added.

TABLE 2.—PLAN OF FERTILIZING IN CEREAL ROTATIONS, MIAMI COUNTY EXPERIMENT FARM

Total fertilizing materials for one rotation; constituents and percentage composition

Plot	Total fertilizing materials for one rotation				Fertilizing constituents contained			Percentage composition		
	Nitrate soda	Acid phosphate	Muriate potash	Total pounds	Ammonia	Phosphoric acid	Potash	Ammonia	Phosphoric acid	Potash
Rotation I: Corn-oats-wheat-clover										
2		500		500		70			14	
3		500	90	590		70	45		12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	160	500	90	*750	30	70	45	4	9.5	6
8		300		†300	9.5	28	25	3	9	8
9		300		300	9.5	28	25	3	9	8
Rotation II: Corn-soybeans-wheat-clover										
2		500		500		70			14	
3		500	90	590		70	45		12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	50	360	90	500	9.5	50	45	2	10	9
8	50	430	20	500	9.5	60	10	2	12	2
9	50	430	20	500	9.5	60	10	2	12	2
Rotation III: Corn-corn-oats-clover										
2		500		500		70			14	
3		500	90	590		70	45		12	7
5	160	500	90	750	30	70	45	4	9.5	6
6	160	500	90	750	30	70	45	4	9.5	6
8	50	200	50	300	9.5	28	25	3	9	8
9	50	200	50	300	9.5	28	25	3	9	8
Rotation IV: Tobacco-wheat-clover										
2		480		480		67			14	
3		480	180	660		67	90		10	14
5	240	480	180	900	45	67	90	5	7.5	10
6	240	480	180	§900	45	67	90	5	7.5	10
8	120	240	90	450	23	34	45	5	7.5	10
9				**	150	116	100			
Rotation V: Corn-wheat-clover										
2		400		400		56			14	
3		400	70	470		56	35		12	7
5	130	400	70	600	24	56	35	4	9.5	6
6	130	400	70	600	24	56	35	4	9.5	6
8		400		†400	120	104	80			
9		400		‡400	120	138	80			
Rotation VI: Potatoes-wheat-clover										
2		400		400		56			14	
3		400	70	470		56	35		10	14
5	130	400	70	600	24	56	35	4	9.5	6
6	120	600	120	840	23	84	60	2	10	7
8		400		†400	120	104	80			
9		400		‡400	120	138	80			

*With 2 tons of limestone dust. †With 8 tons of untreated manure. §With 1 ton of limestone dust. ‡With 8 tons of phosphated manure. **Ten tons of phosphated manure.

In Rotations I and III the only difference in treatment between Plots 5 and 6 is in the lime applied on Plot 6 to the corn crop.

In Rotations II and III the variation between Plots 8 and 9 is in the treatment of the manure on the corn crop.

The corn crop of 1917 on this farm, as elsewhere over the larger part of the cornbelt, was late in maturing, and the long cold winter had set in before the fertility plots were harvested, so that they were not husked out until about the first of March. The large yields are in part due to an abnormal percentage of water, but as this is common to the entire crop it does not effect the comparative results.

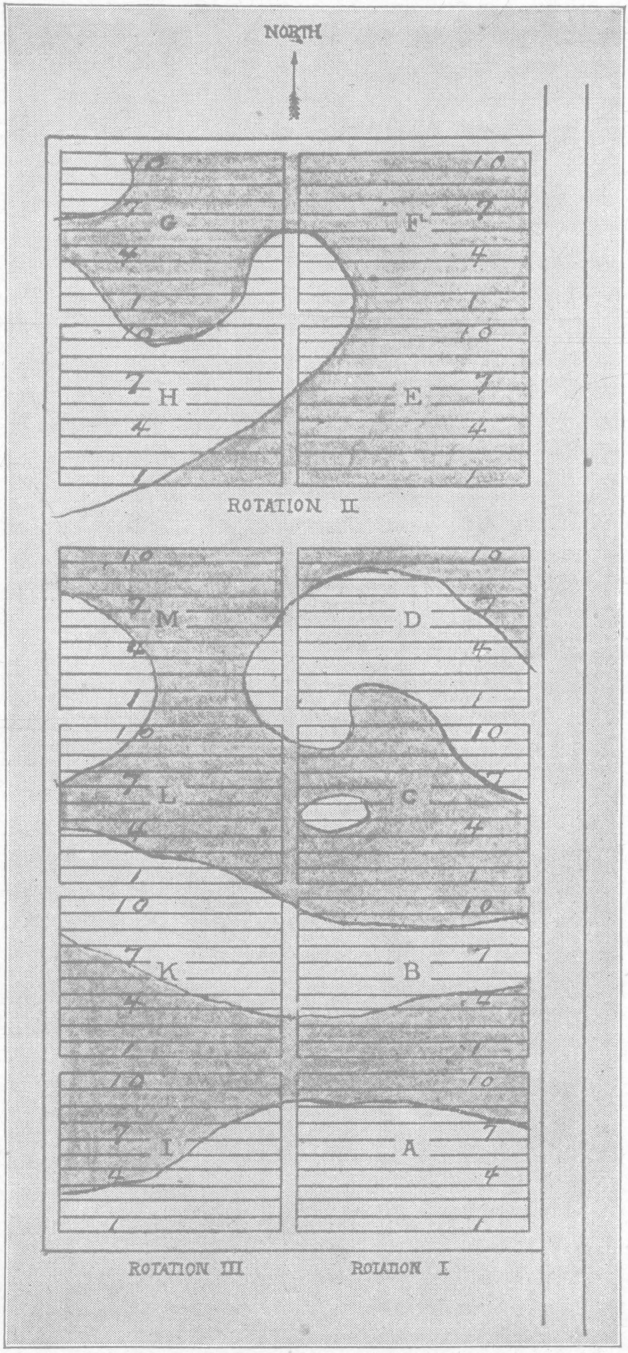
Fertilizers and manure on corn.—In the accompanying plot map (p. 260) the attempt has been made to indicate the respective areas of yellow and dark soil. Of course the boundaries are not as sharply defined as they are shown on the map, the two colors shading into each other by insensible gradations. By taking the unfertilized yields of Rotations I and II for 1916 and 1917, as grown on Blocks C and D, it will be seen that these yields diminish quite regularly on Block C from Plot 1 to Plot 10, while they increase as regularly between plots of the same number on Block D. On Block H, Plot 1 contains more black land than either of the other unfertilized plots and gives a larger yield, while those of Plots 4, 7 and 10 are relatively uniform. Block E is nearly all black land, and its yields are much higher than those given by Block D—mostly yellow land—in the same season. The broad strip separating Blocks E, F, G and H from the land included in Rotations I and II is land that was omitted from the test because it is so low that it serves as a water channel in heavy rains. It will be observed that the plots adjoining this strip all give large yields of corn.

Concerning the fertilized land, it will be seen that all the treatments have produced marked increase in yield, whether on the light or the dark-colored soil, excepting Plot 2, Block E, but even here the yield of Plot 2 is greater than that of Plot 4.

Acid phosphate has evidently been the most effective fertilizer, producing a marked increase when used alone, and causing a further increase than that produced by manure alone when used as a reinforcement of manure.

The addition of muriate of potash seems usually to have increased the yield over that given by acid phosphate alone, but the relatively small increases found on Plots 5 and 6 indicate that potassium and nitrogen are both of minor importance, the clover crops apparently providing sufficient nitrogen and making available sufficient potassium for present needs.

Fertilizers and manure on oats.—The oat crops show a smaller variation between the yields of the yellow and black lands than the corn, and generally a larger relative increase on Plots 5 and 6, which



Areas of light and dark soil in Rotations I to III, Miami County Experiment Farm

TABLE 3, PART I.—Fertilizers and manure on CORN, Miami County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916 Yield Grain	1916 Yield Stover	1916 Increase Grain	1916 Increase Stover	1917 Yield Grain	1917 Yield Stover	1917 Increase Grain	1917 Increase Stover	7-year average Yield Grain	7-year average Yield Stover	7-year average Increase Grain	7-year average Increase Stover	Plot
	Rotation I: Corn-oats-wheat-clover	Block C				Block D								
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	55.24	2,330	.....	.....	34.43	2,790	.....	.....	43.16	2,291	.....	.....	1
2	Acid phosphate, 200 lb	62 71	2,835	11.28	590	62.00	3,950	22.48	913	56 38	2,687	12.68	380	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	65.07	3,085	17.43	925	66 71	4,170	22.09	887	58.69	2,918	14.47	595	3
4	None	43.86	2,075	.....	.....	49.71	3,530	.....	.....	44.75	2,339	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	55.79	2,270	13.07	315	65.29	4,090	13.05	457	56.10	2,731	11.09	374	5
6	Acid phos. 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; powdered limestone, 4,000 lb	56.57	2,160	15.00	325	69 14	4,470	14.38	733	56.41	2,818	11.12	444	6
7	None	40.43	1,715	.....	.....	57.29	3,840	.....	.....	45.55	2,391	.....	.....	7
8	Untreated manure, 8 tons	53.50	2,040	16.64	432	72.43	4,760	4.62	300	60 04	2,884	12 18	371	8
9	Phosphated manure, 8 tons	61.50	2,310	28.22	808	91.29	6,140	12.95	1,060	67.21	3,414	17.05	779	9
10	None	29.71	1,395	.....	.....	88.86	5,700	.....	.....	52.47	2,756	.....	.....	10
	Average unfertilized yield	42.30	1,879	.....	.....	57.57	3,965	.....	.....	46.48	2,444	.....	.....	
	Rotation II: Corn-soybeans-wheat-clover	Block H				Block E								
1	None	55.50	2,305	.....	.....	97.71	4,670	.....	.....	62.93	2,839	.....	.....	1
2	Acid phosphate, 200 lb	56.56	2,340	6.06	165	87.00	4,850	—1.09	393	66.71	2,986	6.17	203	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	59.14	2,395	13.64	350	85.14	4,785	6.66	542	68.14	3,097	9.98	370	3
4	None	40.50	1,915	.....	.....	68.86	4,030	.....	.....	55.78	2,671	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	49.29	2,055	7.81	162	79 43	4,380	12.29	468	61.13	2,941	6.54	313	5
6	Acid phos., 130 lb.; mur. potash, 50 lb.; nitrate soda, 20 lb.	46.43	1,955	3.98	83	75.43	3,920	10.00	127	59.63	2,809	6.24	225	6
7	None	43.43	1,850	.....	.....	63.71	3,675	.....	.....	52.20	2,541	.....	.....	7
8	Acid phos., 160 lb.; mur. potash, 20 lb.; nitrate soda, 20 lb.	47.93	1,925	4.21	67	72.57	4,075	11.00	485	59.87	2,799	8.61	289	8
9	Acid phos., 160 lb.; mur. potash, 20 lb.; nitrate soda, 20 lb.,*	52.43	2,005	8.43	138	69.43	3,975	10.00	309	57.25	2,787	6.94	309	9
10	None	44.29	1,875	.....	.....	57.29	3,420	.....	.....	49.36	2,446	.....	.....	10
	Average unfertilized yield	45.93	1,986	.....	.....	71.89	3,949	.....	.....	55.07	2,624	.....	.....	

*Catch crop after corn.

TABLE 3, PART II.—Fertilizers and manure on CORN, Miami County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916				1917				7-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
	Rotation III: Corn-corn-oats-clover. Corn first crop	Block M				Block I								
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	29.64	1,530	.....	.....	58.57	2,830	.....	.....	39.00	2,051	.....	.....	1
2	Acid phosphate, 200 lb	44.21	1,860	12.97	252	70.57	3,450	13.02	500	50.56	2,437	9.92	306	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	47.71	1,975	14.88	288	67.64	3,590	11.12	520	55.00	2,613	12.72	402	3
4	None	34.43	1,765	.....	.....	55.50	3,190	.....	.....	43.92	2,290	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	48.93	2,035	11.31	187	71.00	3,510	16.31	232	56.22	2,606	12.80	304	5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; powdered limestone, 2 tons	51.21	2,165	10.40	233	74.14	3,815	20.26	448	57.69	2,604	14.79	289	6
7	None	44.00	2,015	.....	.....	53.07	3,455	.....	.....	42.40	2,327	.....	.....	7
8	Untreated manure, 8 tons	57.93	2,495	10.88	343	90.29	5,355	31.03	1,875	64.19	3,024	19.22	667	8
9	Phosphated manure, 8 tons	66.71	2,795	16.62	507	89.50	5,430	24.05	1,925	66.06	3,089	18.52	703	9
10	None	53.14	2,425	.....	.....	71.64	3,530	.....	.....	50.12	2,415	.....	.....	10
	Average unfertilized yield	40.30	1,934	.....	.....	59.70	3,251	.....	.....	43.86	2,271	.....	.....	
	Rotation III: Corn-corn-oats-clover. Corn second crop	Block L				Block M								
1	None	19.86	1,410	.....	.....	28.29	2,290	.....	.....	30.03	1,807	.....	.....	1
2	Acid phosphate, 200 lb	37.79	1,840	13.36	307	52.14	2,960	21.95	473	46.11	2,261	12.70	346	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	50.50	2,255	21.50	598	59.29	3,350	27.19	667	52.30	2,492	15.49	468	3
4	None	33.57	1,780	.....	.....	34.00	2,880	.....	.....	40.18	2,133	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	51.36	2,150	18.77	417	62.57	3,600	23.47	643	53.76	2,589	13.97	449	5
6	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	44.36	1,950	12.74	263	64.86	3,670	20.67	637	52.53	2,651	13.12	503	6
7	None	30.64	1,640	.....	.....	49.29	3,110	.....	.....	39.02	2,155	.....	.....	7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	51.50	2,340	24.57	777	71.43	3,910	17.19	717	58.35	2,959	19.07	732	8
9	Acid phos., 200 lb.; mur. pothsh, 50 lb.; nitrate soda, 50 lb.	53.64	2,330	30.43	843	71.29	3,920	12.11	643	59.22	3,003	19.70	703	9
10	None	19.50	1,410	.....	.....	64.13	3,360	.....	.....	39.77	2,373	.....	.....	10
	Average unfertilized yield	25.89	1,560	.....	.....	43.93	2,910	.....	.....	37.25	2,117	.....	.....	

TABLE 4.—Fertilizers and manure on OATS, Miami County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre.	1916				1917				6-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-oats-wheat-clover	Block B				Block C								
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	32.34	2 290	.....	.....	49.22	3,625	.....	.....	43.04	2,761	.....	.....	1
2	Acid phosphate, 100 lb.	40.62	3,000	4.37	493	50.62	3,980	3.07	535	51.16	2,979	5.98	260	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb.	49.53	3,615	9.38	892	53.12	4,150	7.23	885	56.74	2,172	9.43	492	3
4	None	44.06	2,940	.....	.....	44.22	3,085	.....	.....	49.45	2,638	.....	.....	4
5	Acid phos., 100 lb.; mur. pot., 20 lb.; nitrate soda, 30 lb.	61.72	3,675	19.12	938	59.84	3,485	15.99	588	58.72	2,834	10.23	259	5
6	Acid phos., 100 lb.; mur. pot., 20 lb., nitrate soda, 30 lb.*.	62.34	3,305	21.19	772	54.84	3,845	11.35	1,137	59.01	2,995	11.48	484	6
7	None	39.69	2,330	.....	.....	43.12	2,520	.....	.....	46.56	2,447	.....	.....	7
8	Untreated manure on corn	45.47	2,895	4.43	267	50.47	2,785	6 46	393	50.62	2,722	6.67	285	8
9	Phosphated manure on corn	47.81	3,645	5.41	718	54.53	3,105	9.64	842	52.89	3,062	8.48	588	9
10	None	43.75	3,225	.....	.....	45.78	2,135	.....	.....	44.87	2,510	.....	.....	10
	Average unfertilized yield	39.96	2,696	.....	.....	45.59	2,841	.....	.....	47.20	2,635	.....	.....	
	Rotation II: Corn-corn-oats-clover	Block K				Block L								
1	None	36.09	2,145	.....	.....	46.87	2,100	.....	.....	44.53	2,258	.....	.....	1
2	Acid phosphate, 100 lb.	42.50	2,430	3.23	120	62.19	3,360	13.50	852	54.43	2,661	7.74	154	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb.	51.87	2,890	9.43	415	63.44	4,070	12.92	1,153	59.73	3,172	10.88	415	3
4	None	45.62	2,640	.....	.....	52.34	3,325	.....	.....	51.01	3,005	.....	.....	4
5	Acid phos., 100 lb.; mur. pot., 20 lb.; nitrate soda, 30 lb.	57.97	2,970	13.29	425	61.41	4,035	10.74	857	59.40	3,116	9.30	276	5
6	Acid phos., 100 lb.; mur. pot., 20 lb., nitrate soda, 30 lb.*.	59.53	2,745	15.78	295	57.50	4,160	8.49	1,128	58.62	3,093	9.42	419	6
7	None	42.81	2,355	.....	.....	47.34	2,885	.....	.....	48.28	2,609	.....	.....	7
8	Untreated manure on corn	46.87	2,350	4.89	235	53.12	3,350	5.41	577	54.16	3,092	7.70	635	8
9	Phosphated manure on corn	53.75	2,780	12.61	705	56.09	4,005	8.02	1,343	56.01	3,291	9.22	831	9
10	None	40.31	1,935	.....	.....	48.44	2,550	.....	.....	47.14	2,446	.....	.....	10
	Average unfertilized yield	41.21	2,269	.....	.....	48.75	2,715	.....	.....	48.50	2,593	.....	.....	

*Powdered limestone on corn.

TABLE 5.—Fertilizers and manure on SOYBEANS, Miami County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916—Block G				1917—Block H				6-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Beans	Straw	Beans	Straw	Beans	Straw	Beans	Straw	Beans	Straw	Beans	Straw	
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	17.17	1,970			30.58	2,765			23.76	2,431			1
2	Acid phosphate, 100 lb	20.25	2,585	1.75	562	28.67	2,630	1.39	233	25.08	2,630	1.99	476	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	22.58	3,145	2.74	1.068	26.17	2,130	2.20	102	24.37	2,589	1.96	416	3
4	None	21.17	2,130			20.67	1,660			21.73	2,044			4
5	Acid phos., 100 lb.; mur. potash, 20 lb.; nitrate soda, 30 lb.	22.08	2,975	2.02	795	24.00	2,060	3.75	508	22.97	2,500	1.93	529	5
6	Acid phos., 70 lb.; mur. potash, 20 lb.; nitrate soda, 10 lb.	20.50	2,395	1.56	165	21.08	1,685	1.24	242	20.73	1,997	.39	100	6
7	None	17.83	2,280			19.42	1,335			19.65	1,824			7
8	Acid phosphate, 100 lb	19.33	2,340	2.61	343	24.33	1,940	4.66	587	21.85	2,037	2.53	277	8
9	Acid phosphate, 100 lb	18.42	2,145	2.81	432	22.83	1,880	2.91	508	20.64	2,039	1.65	341	9
10	None	14.50	1,430			20.17	1,390			18.65	1,634			10
	Average unfertilized yield	17.67	1,952			22.71	1,787			20.95	1,983			

receive nitrogen in addition to phosphorus and potassium. Phosphorus, however, has been the principal factor in increasing the yield, as shown by the effect of the 100 pounds of acid phosphate applied on Plot 2. The oats receive no direct manuring, but show a considerable residual effect from the manure applied to the corn.

Fertilizers and manure on soybeans.—The soybeans have given a 6-year average yield on the unfertilized land of nearly 21 bushels per acre, which has been increased by an average of a bushel and three-fourths by the different treatments. When the experiment was begun soybeans were worth about $1.50 per bushel, corn about 50 cents, oats about 40 cents, and wheat about $1. At these prices the acre-value of a 20-bushel crop of soybeans would be about the same as that of a 60-bushel crop of corn, a 75-bushel crop of oats or a 30-bushel crop of wheat. The labor cost of producing an acre of soybeans lies between that of oats and corn. The soybean straw is worth more than oat straw for feeding.

Fertilizers and manure on wheat.—In the corn-oats-wheat-clover and corn-soybeans-wheat-clover rotations the 5-year average yield of wheat on the unfertilized land has been 14 bushels per acre. The average yield for Miami County as a whole for the 10 years, 1900-09, was 15 bushels per acre. It would seem, therefore, that this experiment farm fairly represents the county as a whole. In these rotations, 200 pounds of 16-percent acid phosphate has increased the yield by an average of more than 10 bushels per acre, while there has been sufficient increase in the clover following the wheat to pay for the fertilizer and the cost of its application and of harvesting the extra yields of wheat and hay, if hay is rated at $20 a ton. Miami County grows about 30,000 acres of wheat annually. A net increase of 300,000 bushels of wheat would be no small addition to the income of Miami County farms.

TABLE 6.—Fertilizers and manure on WHEAT, Miami County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916				1917				5-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-oats-wheat-clover	Block A				Block B								
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	7.42	1,355	.....	.....	19.42	2,035	.....	.....	14.72	1,762	.....	.....	1
2	Acid phosphate, 200 lb	16.42	1,940	8.47	592	39.25	3,795	22.25	1,998	26.27	2,694	12.58	1,064	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	21.25	2,075	12.78	733	40.67	3,760	26.08	2,202	26.77	2,634	14.11	1,135	3
4	None	9.00	1,335	.....	.....	12.17	1,320	.....	.....	11.63	1,367	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	22.33	2,310	11.33	787	35.25	3,135	25.91	2,078	24.72	2,677	13.94	1,374	5
6	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.*	23.25	2,505	10.25	793	32.50	3,000	26.00	2,207	27.32	2,761	17.40	1,523	6
7	None	15.00	1,900	.....	.....	3.67	530	.....	.....	9.05	1,174	.....	.....	7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.†	28.08	3,165	14.41	1,318	32.42	3,055	24.06	2,040	26.68	2,864	15.55	1,437	8
9	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.‡	27.50	3,050	15.17	1,257	34.92	3,155	21.86	1,655	27.88	2,987	14.68	1,307	9
10	None	11.00	1,740	.....	.....	17.75	1,985	.....	.....	15.28	1,933	.....	.....	10
	Average unfertilized yield	10.60	1,582	.....	.....	13.25	1,467	.....	.....	12.67	1,559	.....	.....	
	Rotation II: Corn-soybeans-wheat-clover	Block F				Block G								
1	None	7.83	1,005	.....	.....	17.58	1,495	.....	.....	18.42	1,910	.....	.....	1
2	Acid phosphate, 200 lb	13.33	1,500	5.14	358	33.58	2,735	15.78	1,137	27.03	2,684	9.44	793	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	19.42	1,785	10.86	507	35.67	2,860	17.64	1,158	28.70	2,868	11.92	996	3
4	None	8.92	1,415	.....	.....	18.25	1,805	.....	.....	15.95	1,853	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	22.17	2,170	13.61	750	36.75	3,295	18.58	1,452	30.12	3,210	14.68	1,368	5
6	Acid phos., 160 lb.; mur. potash, 20 lb., nitrate soda, 20 lb.	18.08	1,965	9.89	540	34.08	3,005	16.00	1,123	27.07	2,890	12.15	1,058	6
7	None	7.83	1,430	.....	.....	18.00	1,920	.....	.....	14.40	1,821	.....	.....	7
8	Acid phosphate, 170 lb.; nitrate soda, 30 lb.	16.67	1,850	7.89	368	35.42	3,025	19.09	1,272	26.28	2,704	12.42	979	8
9	Acid phosphate, 170 lb.; nitrate soda, 30 lb.§	20.00	2,150	10.28	617	31.67	3,000	17.00	1,413	26.09	2,562	12.77	934	9
10	None	10.67	1,585	.....	.....	13.00	1,420	.....	.....	12.78	1,532	.....	.....	10
	Average unfertilized yield	8.81	1,359	.....	.....	16.71	1,660	.....	.....	15.39	1,779	.....	.....	

*Powdered limestone on corn. †Untreated manure on corn. ‡Phosphated manure on corn. §Catch crop to follow corn;

Residual effect on clover of treatment of previous crops.—The 4-year average yield of clover on the unfertilized land in the cereal rotations has been a ton and a half per acre. This yield has been increased more than 700 pounds by the residual effect of 500 pounds of acid phosphate applied to the preceding crops of the rotation, the hay thus paying for all the fertilizer, if it be rated at $20 a ton.

TABLE 7.—Residual effect on CLOVER of fertilizing materials applied to previous crops of rotation, Miami County Experiment Farm—Pounds per acre

Plot	Fertilizing materials on previous crops					Yield and increase of crop					
						1916		1917		Average	
	Acid phosphate	Muriate potash	Nitrate soda	Powdered limestone	Manure	Yield	Increase	Yield	Increase	Yield	Increase
	Rotation I: Corn-oats-wheat-clover					Block D		Block A		4-year average	
1						2,800		3,368		3,380	
2	500					4,444	1,437	4,042	828	3,968	763
3	500	90				4,311	1,096	3,621	562	3,647	617
4						3,422		2,905		2,855	
5	500	90	160			3,822	15	3,537	646	3,477	562
6	500	90	160	4,000		4,844	651	3,579	702	3,801	827
7						4,578		2,863		3,035	
8	200	50	50		8 tons	5,689	978	3,705	856	3,786	666
9	200	50	50		†8 tons	5,644	799	3,705	870	4,118	913
10						4,978		2,821		3,289	
*						3,946		2,989		3,140	
	Rotation II: Corn-soybeans-wheat-clover					Block E		Block F		4-year average	
1						4,667		2,989		3,600	
2	500					4,622	325	4,126	1,053	4,301	759
3	500	90				4,356	430	4,126	968	4,241	757
4						3,556		3,242		3,426	
5	500	90	160			3,911	251	3,958	941	3,850	433
6	360	90	50			3,733	—30	3,789	996	3,706	299
7						3,867		2,568		3,397	
8	430	20	50			4,000	281	3,874	801	3,884	432
9	430	20	50			3,956	386	4,168	589	4,014	508
10						3,422		4,084		3,561	
*						3,878		3,221		3,496	
	Rotation III: Corn-corn-oats-clover					Block I		Block N		4-year average	
1						4,933		2,989		2,640	
2	500					5,600	815	2,927	190	3,200	563
3	500	90				5,956	1,319	3,158	674	3,384	750
4						4,489		2,232		2,631	
4	500	90	160			4,933	696	2,863	870	3,153	604
6	500	90	160	4,000		4,622	637	2,779	1,024	3,362	896
7						3,733		1,516		2,383	
8	200	50	50		8 tons	6,400	2,178	1,726	463	3,545	1,038
9	200	50	50		†8 tons	6,800	2,089	2,063	1,052	3,892	1,260
10						5,200		758		2,755	
*						4,589		1,874		2,602	

*Average unfertilized yield. †Phosphated manure (40 lb. acid phosphate per ton of manure).

Financial results.—If we rate corn at $1 a bushel, oats at 75 cents, soybeans at $3, wheat at $2, and hay at $20 a ton, to correspond approximately to present prices, the four crops grown on the unfertilized land in the experiments under consideration would have the following total values per acre for each 4-year period:

Rotation I		Rotation II		Rotation III	
Corn	$46.48	Corn	$55.07	Corn 1st	$43.86
Oats	35.40	Soybeans	62.85	Corn 2d	37.25
Wheat	25.34	Wheat	30.78	Oats	36.37
Hay	31.40	Hay	34.96	Hay	26.02
Total	$138.62	Total	$183.66	Total	$143.50

The next table shows the total value of the increase following each treatment for the 4 years of the rotation, together with cost of treatment, with 16-percent acid phosphate at $24 a ton, muriate of potash at 25 cents a pound, nitrate of soda at 5 cents a pound, powdered limestone at $3.50 a ton and manure at 75 cents a ton.

TABLE 8.—Financial outcome of use of fertilizers and manure in CEREAL rotation, Miami County Experiment Farm

Rotation		Plot 2 Acid phosphate	Plot 3 Acid phosphate, muriate of potash	Plot 5 Acid phosphate, muriate of potash, nitrate of soda	Plot 6 Acid phosphate, muriate of potash, nitrate soda, limestone	Plot 8 Manure and fertilizer	Plot 9 Manure, phosphate and fertilizer
I	Value of increase	$49.95	$55.94	$52.37	$62.80	$54.94	$61.90
	Cost of treatment	6.00	28.50	36.50	43.50	23.40	27.24
	Net gain	43.95	27.44	15.87	19.30	31.54	35.66
II	Value of increase	38.61	47.22	46.02	34.70	45.36	42.51
	Cost of treatment	6.00	28.50	36.50	29.32	11.82	11.82
	Net gain	32.61	18.77	9.52	5.38	33.54	30.79
III	Value of increase	34.05	43.87	39.78	43.93	54.44	57.72
	Cost of treatment	6.00	28.50	36.50	43.50	23.40	27.24
	Net gain	28.05	15.37	3.28	.57	31.04	30.48

The irregularities of soil in this test are too great to permit any but the most general conclusions to be drawn as yet, but it is clearly evident that acid phosphate and manure have both been used with a large profit if the manure is charged only with the cost of hauling out and spreading.

Muriate of potash added to acid phosphate has apparently increased the yield over that produced by acid phosphate alone, but not sufficiently to justify its purchase at present prices. Nitrate of soda has apparently been used at a decided loss. The results with ground limestone are contradictory.

TABLE 9.—Fertilizers and manure on CORN and WHEAT in corn-wheat-clover rotation, Miami County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916 Yield		1916 Increase		1917 Yield		1917 Increase		Average Yield		Average Increase		Plot
		Grain	Stover straw	Grain	Stover straw	Grain	Stover straw	Grain	Stover straw	Grain	Stover straw	Grain	Stover straw	
	Rotation V: Corn	Block R				Block S				3-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	39.36	2,385			59.00				48.26				1
2	Acid phosphate, 200 lb	37.50	2,395	—4.93	—25	53.57		—1.81		44.52		—3.36		2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	60.14	2,815	14.64	360	48.00		—3.76		53.78		6.28		3
4	None	48.57	2,490			48.14				47.12				4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	57.14	2,780	6.05	233	48.57		3.86		51.07		4.38		5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; powdered limestone, 2 tons	56.50	2,800	2.88	197	44.29		3.00		49.23		3.15		6
7	None	56.14	2,660			37.86				45.86				7
8	Untreated manure, 8 tons	58.36	2,885	4.96	297	41.86		3.52		53.05		7.79		8
9	Phosphated manure, 8 tons	62.14	3,030	11.47	513	41.86		3.05		56.57		11.90		9
10	None	47.93	2,445			39.29				44.07				10
	Average unfertilized yield	48.00	2,495			46.07				46.33				
	Rotation V: Wheat	Block Q				Block R				2-year average				
1	None	8.33	1,300			6.50	910			7.41	1,105			1
2	Acid phosphate, 200 lb	12.83	1,180	5.19	—62	22.42	2,355	14.53	1,212	17.62	1,767	9.86	575	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	18.08	1,565	11.14	382	31.83	3,440	22.55	2,063	24.95	2,502	16.84	1,222	3
4	None	6.25	1,125			10.67	1,610			8.46	1,367			4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	17.33	1,860	10.77	678	36.08	3,435	23.30	1,502	26.70	2,647	17.03	1,090	5
6	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.*	19.50	1,830	12.64	592	35.00	3,400	20.11	1,143	27.25	2,615	16.37	867	6
7	None	7.17	1,295			17.00	2,580			12.08	1,937			7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.†	20.92	2,120	13.89	875	39.33	3,840	22.41	1,405	30.12	2,980	18.15	1,140	8
9	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.‡	23.83	2,320	16.94	1,125	39.67	3,970	22.84	1,680	31.75	3,145	19.89	1,402	9
10	None	6.75	1,145			16.75	2,145			11.75	1,645			10
	Average unfertilized yield	7.12	1,216			12.73	1,811			9.92	1,513			

*Powdered limestone on corn. †Untreated manure on corn. ‡Phosphated manure on corn.

THE CORN-WHEAT-CLOVER ROTATION

In Tables 9 and 10 is given the outcome to date of a 3-year cereal rotation of corn, wheat and clover, which was begun in 1915, and in which three crops of corn have been grown, followed by two crops of wheat and one of clover.

In this first round the corn shows a small and irregular effect from the fertilizers, which is a common experience in the first application of fertilizers; but the wheat that follows the corn has evidently profited not only by the treatment given to the wheat crop directly but also by that given to the preceding crop.

This experiment supports the other work on this farm in showing the value of acid phosphate, notwithstanding the contradictory outcome in the corn crop, which will probably be overcome with further progress in the work.

TABLE 10.—Residual effect on CLOVER and financial outcome of experiment in use of fertilizers and manure in 3-year rotation of corn, wheat and clover. Miami County Experiment Farm

Plot	Total fertilizer on previous crops					Clover 1917—Block		Financial outcome		
	Acid phosphate	Muriate of potash	Nitrate of soda	Powdered limestone	Manure	Yield	Increase	Total value of increase	Total cost of treatment	Net gain
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Tons*	*Lb.*	*Lb.*	*Doll.*	*Doll.*	*Doll.*
1	.....	.....	.....	.....	.....	3,116	.....	.....	.....	.....
2	400	.....	.....	.....	.....	2,400	§—463	11.73	4.80	6.93
3	400	70	.....	.....	.....	3,032	421	44.17	22.30	21.87
4	.....	.....	.....	.....	.....	2,358	.....	.....	.....	.....
5	400	70	130	.....	.....	2,484	140	39.84	28.80	11.04
6	400	70	130	4,000	.....	2,611	281	38.70	35.80	2.90
7	.....	.....	.....	.....	.....	2,316	.....	.....	.....	.....
8	200	50	50	.....	8	2,821	616	50.25	18.40	31.85
9	520	50	50	.....	‡8	2,863	769	59.37	22.24	37.13
10	.....	.....	.....	.....	.....	1 983	.....	.....	.....	.....
	.....	.....	.....	.....	.....	2 443	.....	.....	.....	.....

‡Manure and 320 lb. acid phosphate mixed before application. §Decrease.

THE TOBACCO-WHEAT-CLOVER ROTATION

A 3-year rotation of tobacco, wheat and clover was begun on this farm in 1912, being located on black land. The yields obtained in this test are given in Table 11.

TABLE 11.—Fertilizers and manure on TOBACCO grown in rotation with wheat and clover. Miami County Experiment Farm

Plot	Treatment per acre All on tobacco	Tobacco: 1916—Block O Yield	Tobacco: 1916—Block O Increase	Tobacco: 1917—Block P Yield	Tobacco: 1917—Block P Increase	Tobacco: 6-year average Yield	Tobacco: 6-year average Increase	Wheat: 1916—Block N Grain Yield	Wheat: 1916—Block N Grain Increase	Wheat: 1916—Block N Straw Yield	Wheat: 1916—Block N Straw Increase	Wheat: 1917—Block O Grain Yield	Wheat: 1917—Block O Grain Increase	Wheat: 1917—Block O Straw Yield	Wheat: 1917—Block O Straw Increase	Wheat: 5-year average Grain Yield	Wheat: 5-year average Grain Increase	Wheat: 5-year average Straw Yield	Wheat: 5-year average Straw Increase	Clover: 1916—Block P Yield	Clover: 1916—Block P Increase	Clover: 1917—Block N Yield	Clover: 1917—Block N Increase	Clover: 4-year average Yield	Clover: 4-year average Increase
		Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
1	None	1,100	.....	443	.....	1,127	.....	24.33	.....	3,290	.....	27.83	.....	3,530	.....	26.02	.....	3,047	.....	5,333	.....	5,221	.....	5,558	.....
2	Acid phosphate, 480 lb	1,360	65	725	171	1,385	196	35.83	8.72	3,950	577	45.50	10.67	5,070	927	34.63	6.08	3,181	58	5,778	712	4,547	—393	6,750	1,264
3	Acid phosphate, 480 lb.; muriate of potash, 180 lb.	1,635	145	980	316	1,531	281	37.67	7.78	4,190	733	49.17	7.34	5,850	1,093	37.08	6.00	3,831	632	5,778	978	4,463	—197	6,693	1,278
4	None	1,685	.....	775	.....	1,312	.....	32.67	.....	3,540	.....	48.83	.....	5,370	.....	33.62	.....	3,274	.....	4,533	.....	4,379	.....	5,344	.....
5	Acid phosphate, 480 lb.; muriate of potash, 180 lb.; nitrate of soda, 240 lb.	1,775	242	1,040	282	1,556	333	35.83	6.83	3,850	590	52.00	7.39	6,280	1,023	38.07	7.06	3,953	811	4,800	741	4,126	0	6,001	768
6	Acid phosphate, 480 lb.; muriate of potash, 180 lb.; nitrate of soda, 240 lb.; powdered limestone, 2,000 lb.	1,700	318	1,040	298	1,519	384	29.50	4.16	3,230	250	53.25	12.86	6,905	1,762	37.52	9.11	3,777	768	4,444	859	3,958	84	5,822	698
7	None	1,230	.....	725	.....	1,047	.....	21.67	.....	2,700	.....	36.17	.....	5,030	.....	25.80	.....	2,876	.....	3,111	.....	3,621	.....	5,014	.....
8	Acid phosphate, 240 lb.; muriate of potash, 90 lb.; nitrate of soda, 120 lb.	1,305	180	835	105	1,230	224	21.33	1.55	2,420	—160	37.33	.68	4,760	—141	27.17	1.65	2,523	—279	4,267	356	3,705	28	5,385	273
9	Acid phosphate, 400 lb.; stable manure, 10 tons	1,415	395	1,005	270	1,252	286	26.83	8.94	3,390	930	42.00	4.87	5,280	508	31.53	6.29	3,342	614	5,244	533	3,876	143	5,881	671
10	None	915	.....	740	.....	924	.....	16.00	.....	2,340	.....	37.61	.....	4,643	.....	24.95	.....	2,655	.....	5 511	.....	3,789	.....	5,307	.....
	Average unfertilized yields	1,242	.....	671	.....	1,104	.....																		
*								23.67	.....	2,967	.....	37.61	.....	4,643	.....	27.60	.....	2 963	.....	4,622	.....	4,252	.....	5,305	.....

*Average unfertilized yield.

With tobacco at 15 cents a pound, wheat at $2 a bushel and hay at $20 a ton, and with fertilizing materials as in previous tables the financial outcome of this test has been as shown below:

TABLE 12.—Fertilizers and manure on TOBACCO grown in rotation with wheat and clover. Total value of increase, cost of treatment and net gain per acre for one rotation

Plot	Total fertilizing materials per acre					Total value of increase	Total cost of treatment	Net gain
	Acid phosphate	Muriate potash	Nitrate soda	Powdered limestone	Manure			
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Tons*	*Doll.*	*Doll.*	*Doll.*
2	480	.....	.....	.....	.....	53.20	5.76	47.44
3	480	180	.....	.....	....	66.93	45.00	21 93
5	480	180	240	.....	.....	71.75	57.00	14.75
6	480	180	240	2,000	.....	82.80	60.50	22.30
8	240	90	120	.....	.....	39.63	28.50	11.13
9	400	.....	.....	.....	10	58.34	12.30	46.04

This table shows that, although there has been an increased yield for every addition of fertilizing materials, the cost of nitrogen and potassium has outrun the value of the increase due to their use.

THE POTATOES-WHEAT-CLOVER ROTATION

A 3-year rotation of potatoes, wheat and clover was begun in 1916. The potato crop was a failure that season and made less than half a crop the next. The wheat, however, has given large yields, with a large and fairly consistent increase from the treatments, considering that this is the first course. The results for the two seasons are given in Table 13.

In computing the value of the increase in this table the potato and clover crops are excluded, as it is not probable that the irregularities in the yields of these crops were due to the treatments.

SUMMARY OF FERTILITY EXPERIMENTS

These experiments with fertilizers on Miami County soil show that at the present prices of crops and fertilizing materials acid phosphate may be used with the practical certainty of recovering its cost with a large profit. They show that the yields of crops are further increased by additions of potassium and nitrogen to acid phosphate, but that the cost of these elements in commercial fertilizers outruns the value of the increase, and consequently the net gain is smaller than when acid phosphate is used alone.

They show that manure produces a regular and large increase of crop, and that when its cost is only that of moving it from the stable to the field there is a larger profit from its use than from that of any other fertilizer except acid phosphate.

TABLE 13.—Fertilizers and manure on POTATOES and WHEAT grown in rotation with clover, Miami County Experiment Farm

Plot	Fertilizers on wheat—Pounds per acre				Wheat												Plot
					1916—Block T				1917—Block U				2-year average				
					Yield		Increase		Yield		Increase		Yield		Increase		
	Acid phosphate	Muriate potash	Nitrate soda	Manure	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Lb.	*Lb.*	*Lb.*	*Tons*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1					20.70	2,208			39.67	4,059			30.18	3,133			1
2	200				26.26	2,622	8.12	491	50.60	5,244	12.65	1,196	38.43	3,933	10.38	843	2
3	200	20			24.53	2,438	8.94	383	51.75	5,635	15.53	1,599	38.14	4,036	12.23	991	3
4					13.03	1,978			34.50	4,025			23.76	3,001			4
5	200	20	80		27.21	2,737	12.71	694	55.97	6,072	22.17	1,890	41.59	4,404	17.44	1,292	5
6	200	20			28.75	2,702	12.78	594	54.82	6,716	21.73	2,377	41.78	4,709	17.25	1,485	6
7					17.44	2,173			32.39	4,496			24.91	3,334			7
8	400				32.01	3,139	14.31	981	52.13	6,187	23.00	1,955	42.07	4,663	18.65	1,468	8
9	400				30.09	3,024	12.14	882	46.57	6,405	20.69	2,438	38.33	4,714	16.41	1,660	9
10					18.21	2,127			22.62	3,703			20.41	2,915			10
					17.34	2,122			32.29	4,071			24.81	3,096			

Plot	Fertilizers on potatoes—Pounds per acre				Potatoes 1917—Block V		Clover 1917—Block T		Total fertilizing materials per acre				Total value of increase†	Total cost of treatment	Net gain or loss(—)	Plot
	Acid phosphate	Muriate potash	Nitrate soda	Manure	Yield	Increase	Yield	Increase	Acid phosphate	Muriate potash	Nitrate soda	Manure				
	Lb.	*Lb.*	*Lb.*	*Tons*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Tons*	*Doll.*	*Doll.*	*Doll.*	
1					93.93		4,164									1
2	200				59.03	—21.73	3,486	—452	400				20.76	4.80	15.96	2
3	200	50			55.77	—11.82	3,099	—613	400	70			24.46	22.30	2.16	3
4					54.43		3,486									4
5	200	50	50		63.82	6.64	3,099	—355	400	70	130		34.88	28.80	6.08	5
6	400	100	100		57.12	—2.80	3,874	452	600	120	100		34.50	42.20	—7.70	6
7					62.67		3,390									7
8				8	78.97	9.85	4,067	516	400			8	37.30	10.80	26.50	8
9	320*			*8	78.39	2.81	3,874	161	720			8	32.82	14.64	18.18	9
10					82.03		3,874									10
					73.26		3 728									

*Manure and acid phosphate mixed before application, "Phosphated manure." †Computed on the wheat crop only.

They show that on this soil, largely derived from limestones, the addition of ground limestone is not likely to be profitable for the production of ordinary crops. Other experiments, however, indicate that alfalfa may respond to lime more promptly than do the crops grown in these tests.

In general, it appears that this soil is markedly deficient in phosphorus, and that when this deficiency is supplied clover grown in short rotations will furnish all the nitrogen required and temporarily at least most of the potassium; that is, the clover roots will have brought into available condition a considerable amount of the crude potassium of the soil, and any further deficiency can be made up by small applications of manure.

Miami County grows annually more than 90,000 acres of wheat and corn. If 200 pounds of acid phosphate per acre, spread over these 90,000 acres, should produce half the effect on the average Miami County soil that it is doing on the county experiment farm it would bring to the farmers of that county each year $200,000 more than its cost, at present prices of acid phosphate and farm produce.

VARIETY COMPARISONS

DEPARTMENT OF AGRONOMY

Corn.—Variety tests with corn have been conducted at the Miami County Experiment Farm for the last 6 years. The yields are given for each year, and for 5 and 6-year averages, including the stover. In the 6-year average Darke County Mammoth is first in yield and Cook's 75, a strain of Reid, second. In the 5-year average Boone County White leads, with Darke County Mammoth, second. The yield of stover is largest with the Boone County White—a variety not adapted to the growing of grain in the county on account of failure to mature.

TABLE 14.—Varieties of CORN, Miami County Experiment Farm

Variety	Yield per acre (bushels)						Average		
	1917	1916	1915	1914	1913	1912	6-yr. Grain	5 yr. Grain	5 yr. Stover
							Bu.	*Bu.*	*Lb.*
Leaming	63.25	52.07	59.37	63.31	48.61	49.80	56.07	57.32	2,308
Clarage	60.21	46.64	57.53	63.12	59.91	.....	.....	57.48	2,241
White Cap	57.44	48.64	59.13	58.21	55.86	.....	.....	55.86	2,458
Cook's 75	62.87	52.85	58.89	64.40	57.29	64.03	60.05	59.26	2,679
Reid (Orcutt)	63.63	54.87	55.56	62.93	59.84	.....	.....	59.31	2,984
Ohio 84	58.64	48.69	52.35	61.09	47.60	44.74	52.18	53.67	2,274
Boone County White	60.15	59.60	71.76	67.95	.....	59.97	.....	63.89	3,864
Leaming-Cuppy	.....	.....	.....	61.16	48.53	.....	.....	54.84	.....
Darke County Mammoth	67.87	54.50	61.87	65.55	58.39	65.22	62.23	61.64	2,906
Booher	.....	.....	53.37	.....	.....	.....	.....	.....	.....
Mortgage Lifter	.....	.....	63.72	.....	.....	.....	.....	.....	.....
Connor's Prolific	47.25	42.79	.....	.....	.....	.....	.....	.....	.....

Oats.—Seven varieties of oats have been tested for 6 years, with the result that the Big Four stands highest in yield, Ohio 6203, second and Ohio 6222, third. It is of interest to note the wide variation different seasons. A very early variety, Ohio 7009, leads by a wide margin in 1916, while it stands lowest in 1913—due entirely to seasonal conditions.

The competing spring crops, barley and emmer, have been included in the test from the start. Neither has proved as profitable as oats. The bushel of barley weighs 48 pounds and accordingly its yield is greater than that of emmer, which is computed at 32 pounds.

TABLE 15.—Varieties of OATS, Miami County Experiment Farm

Variety	Yield per acre (bushels)						6-yr. average	
	1917	1916	1915	1914	1913	1912	Grain	Straw
							Bu.	*Lb.*
Big Four	55.87	66.69	69.03	48.60	62.99	78.17	63.56	2,830
Silver Mine	54.38	62.53	58.78	44.38	61.07	77.76	59.82	2,748
Swedish Select	49.38	65.18	56.27	42.29	61.12	78.59	58.80	2,661
Ohio 7009	59.53	75.55	64.76	48.75	44.14	74.21	61.16	1,812
Ohio 6203	56.96	70.34	66.85	45.63	60.75	75.15	62.61	2,886
Ohio 6222	58.76	60.46	67.78	54.38	51.85	*78.70	61.99	2,890
Wideawake	54.69	57.42	61.79	47.19	57.11	71.40	58.27	3,050
Oderbrucker barley	43.75	41.89	32.40	22.21	36.03	32.08	34.73	2,028
Iowa 103	58.76	.....	.....	.....	.....	.....	.....	.....
Emmer	20.94	N. G.	26.12	35.78	61.56	35.94	36.07	2,346

*A different selection of Improved American in 1912.

Wheat.—Fourteen varieties of wheat have been tested for a period of 5 years, grown in two different rotations. By means of a common check it is possible to place them on a comparative basis. As a 5-year average, the Gladden leads slightly in yield with the Trumbull second, Valley third, Portage fourth and Gypsy fifth. It will be noted that these five varieties are close together in yield, there being less than 2 bushels between the extremes.

TABLE 16.—Varieties of WHEAT, Miami County Experiment Farm

Variety	Yield per acre (bushels)					5-year average	
	1917	1916	1915	1914	1913	Grain	Straw
						Bu.	*Lb.*
Fultz	35.85	23.21	35.73	31.27	35.55	32.32	4,032
Trumbull	38.52	25.91	38.90	37.32	41.44	36.42	3,790
Ohio 8106	33.01	27.15	33.72	34.15	36.83	32.97	3,750
Poole	32.02	27.72	33.57	34.99	38.50	33.36	3,970
Portage	34.19	20.16	39.90	35.11	49.44	35.76	3,660
Gypsy	36.30	28.78	38.12	35.37	39.32	35.58	4,107
Gladden	40.91	28.44	36.16	35.42	43.85	36.96	4,439
Mediterranean	39.05	27.50	33.49	32.92	38.47	34.29	4,147
Rudy	38.32	25.72	35.26	33.76	43.22	35.26	3,661
Turkey Red	29.52	23.53	30.53	37.48	38.58	31.93	3,857
Valley	34.27	26.69	35.48	41.29	42.10	35.97	4,231
Goens	36.43	21.53	38.56	42.76	37.94	35.44	3,981
Nigger	35.19	24.19	34.32	36.54	42.94	34.64	3,802
Velvet Chaff	35.02	23.44	33.90	37.71	36.77	33.37	3,844
Ohio 9920	41.94	28.30	.....	.....	.....	.....	3,220

For three seasons wheat has been seeded at intervals of 1 week, beginning September 15 and ending October 27, other conditions being uniform. The seedings made September 22 have given slightly the largest yield, with September 29 a close second and October 6, third. Seedings made the last of October have amounted to but little.

TABLE 17.—Early and late seeding of wheat

Date of seeding	Yield per acre (bushels)			Average
	1917	1916	1915	
September 1	39.83	5.37	.....	.....
September 8	42.50	.....	.....	.....
September 15	43.00	6.71	23.33	24.35
September 22	46.00	7.67	30 00	27.89
September 29-30	*47.45	7.86	26.67	27.33
October 6	40.33	12.84	24.67	25.95
October 13	29.67	8.43	11.33	16.48
October 20	.....	.....	2.33	.....
October 23	*10.33	.....	.....	.....
October 27	*11 17	6.32	2.00	6.50

*Weedy.

Soybeans.—The soybean test has included eight varieties for 5 consecutive years and, for comparison, a standard early variety of cowpeas. As a 5-year average, the Elton, a yellow variety of soybeans, is first in yield, Mongol second, Ebony third, and Ohio 9035 fourth. The Elton was formerly known as the Chestnut.

The yield of cowpeas is of little moment compared with soybeans.

TABLE 18.—Varieties of SOYBEANS, Miami County Experiment Farm

Variety	Yield per acre (bushels)					5-year average	
	1917	1916	1915	1914	1913	Grain	Straw
						Bu.	*Lb.*
Ohio 9100	18.54	17.81	16.75	22.00	12.81	17.58	2,308
Mongol	18.21	20.00	22.33	27 86	15.29	20.74	2,526
Elton	24.60	15.14	23.61	26.25	16.93	21.31	1,868
Ohio 9035	10.37	18.36	23.08	27.64	16.67	19.22	2,179
Ebony	27.91	20.22	20.05	19.66	15.62	20.69	2,239
Ohio 7496	9.19	12.97	25.07	26.56	20.26	18.81	2,528
Ohio 9016	14.16	9.97	24.33	23.61	17.12	17.84	1,912
Medium Green	10.71	15.14	23.83	23.00	15.81	17.70	1,987
New Era cowpeas	7.22	3.25	3.17	9.37	8.67	6.34	2 701

EXPERIMENTS IN HOG FEEDING

GEORGE R. EASTWOOD

FEEDING BROOD SOWS AND PIGS ON CLOVER PASTURE

Five sows are 38 spring pigs were weighed June 8, 1916, and turned on 2 acres of clover in Field D June 9, 1916. The sows and pigs were not turned in the clover on the day they were weighed

because of a rain that made it rather wet for some of the pigs that were very young. They were fed all the ear corn they would clean up readily without waste and in addition to the ear corn, tankage was mixed with water and fed in the form of a thin slop. The sows and pigs were allowed to run on this pasture until September 4, 1916, when they were again weighed and the pigs weaned.

The results secured are shown in the following table:

	Pounds
Weight of five sows June 8, 1916	1,934.0
Weight of five sows September 4, 1916	1,778.5
Loss in weight of five sows	155.5
Weight of 38 pigs June 8, 1916	479.0
Weight of 37 pigs September 24, 1916*	2,083.5
Gain by pigs	1,607.5
Total gain on sows and pigs	1,452.0
Average daily gain per head	.39
Total feed consumed† (corn 4,695 lb.; tankage 295.75 lb.)	4,990.75
Feed consumed per 100 lb. of gain	343.72

After the 37 pigs were weaned they were transferred to 1 acre of clover in rye stubble in Field B and fed ear corn and approximately one-fourth of a pound of tankage daily per pig until October 5, 1916.

The results secured during these 31 days are shown in the following table:

	Pounds
Initial weight September 4, 1916	2,083.5
Final weight October 5, 1916	2,785.5
Total gain	702.0
Average daily gain per head	.612
Total feed consumed (ear corn 1,720.5 lb.; tankage 279.0 lb.)	1,999.5
Feed consumed per 100 lb. of gain	284.83

CHEAP GAIN ON CLOVER PASTURE

Eighteen shoats averaging in weight approximately 104 pounds were turned on 1 acre of clover in Field D on June 8, 1916, and fed a limited ration of ear corn until July 31, 1916, excepting that during the first 2½ days on the clover they received 10 pounds of tankage.

During these 53 days the shoats consumed 2,682 pounds of corn and 10 pounds of tankage and made a total gain of 936 pounds, or an average daily gain per head of 0.98 pound and required 287.61 pounds of feed (corn and tankage) per 100 pounds of gain.

*One pig died June 20, weight 3 pounds.
†Corn figured on shelled basis.

CLOVER PASTURE VS. HOGGING DOWN RYE

Eighteen shoats averaging in weight approximately 156 pounds were divided into two as nearly equal lots as possible on July 31, 1916. One lot was fed ear corn and approximately 0.2 pound of tankage daily per head and allowed the run of 3 acres of clover pasture in Field D that had previously been pastured.

The other lot was fed approximately 0.2 pound of tankage daily per head and allowed to hog down 2 acres of rye in Field B. These pigs also had some clover, as the clover seeded in the rye had made considerable growth. One of the 3 acres of rye in Field B was cut and threshed as a basis for estimating the amount on the 2 acres hogged off. It was estimated, on basis of the acre threshed, that the 2 acres standing contained 640 pounds of rye.

The results of the test are shown in the following table:

	RATIONS	
	Ear corn, tankage and clover pasture	Standing rye and tankage
Initial weight July 31, 1916 ...pounds..	1,404.5	1,406.5
Final weight September 4, 1916...do....	1,743.0	1,529.5
Total gain.....do....	338.5	123.0
Average daily gain .....do....	1.07	.39
Total feed consumed:		
Corn, or rye.....do....	1,255.5	640.0
Tankage .....do....	61.25	61.25
Feed consumed per 100 lb. gain...do....	388.98	570.12

HOGGING DOWN CORN

Nine acres of corn was hogged down; 3 acres with hogs averaging approximately 196 pounds and 6 acres with pigs averaging approximately 75 pounds at the time they were turned into the cornfield. In order to obtain a fair estimate of the corn in these fields a portion of each field was husked, weighed and tested for moisture at the time the hogs were turned into the field. The yields were estimated on a 15½ percent moisture basis. The corn husked from the field in each instance was fed back to the hogs before they were removed from the field. The hogs were fed approximately a quarter of a pound of tankage daily per head while they were hogging down the corn.

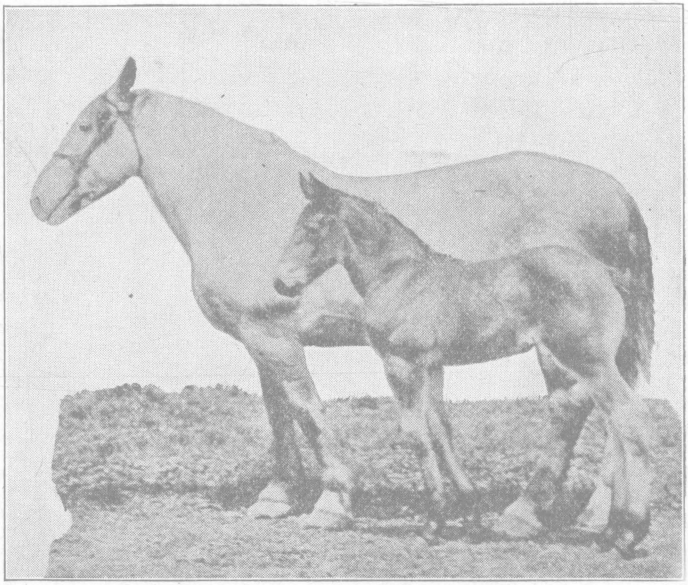
The 18 hogs, averaging approximately 196 pounds, were on a 3-acre field estimated to yield 35.9 bushels per acre 34 days, September 23 to October 27, while the 37 pigs averaging approximately 75 pounds were on a similar 3-acre field, estimated to yield 32.8 bushels per acre, 26 days, October 5 to 31. The larger hogs made an average daily gain of 2.01 pounds per head and showed a return

of $1.06 per bushel for corn on basis of $9.50 per hundredweight for live hogs, while the smaller hogs made an average daily gain of 1.31 pounds per head and showed a return of $1.15 per bushel for corn on a basis of $9.50 per hundredweight for live hogs.

The 37 smaller hogs were transferred to another 3-acre field, estimated to yield 42.5 bushels per acre, which they hogged down in 25 days, making an average daily gain of 1.37 pounds per head but requiring slightly more corn per hundred pounds of gain than they required on the previous field hogged down, showing a return of 90 cents per bushel for the corn on a basis of $9.50 per hundredweight for live hogs.

The following table shows a summary of the results secured in hogging down the three 3-acre fields. In the statements given tankage was charged at $50 per ton; no charge is made for labor.

Total yield—9 acres	bushels	333.6
Total pork produced	pounds	3,748.5
Total tankage fed	do	578.0
Returns per bushel of corn, hogs at 9½ cts.	dollars	1.02



High grade percheron brood mare and colt

BULLETIN

OF THE

Ohio Agricultural Experiment Station

NUMBER 323 MAY, 1918

COUNTY EXPERIMENT FARMS IN OHIO

PART II

PAULDING COUNTY EXPERIMENT FARM

SIXTH AND SEVENTH ANNUAL REPORTS, FOR 1916 AND 1917

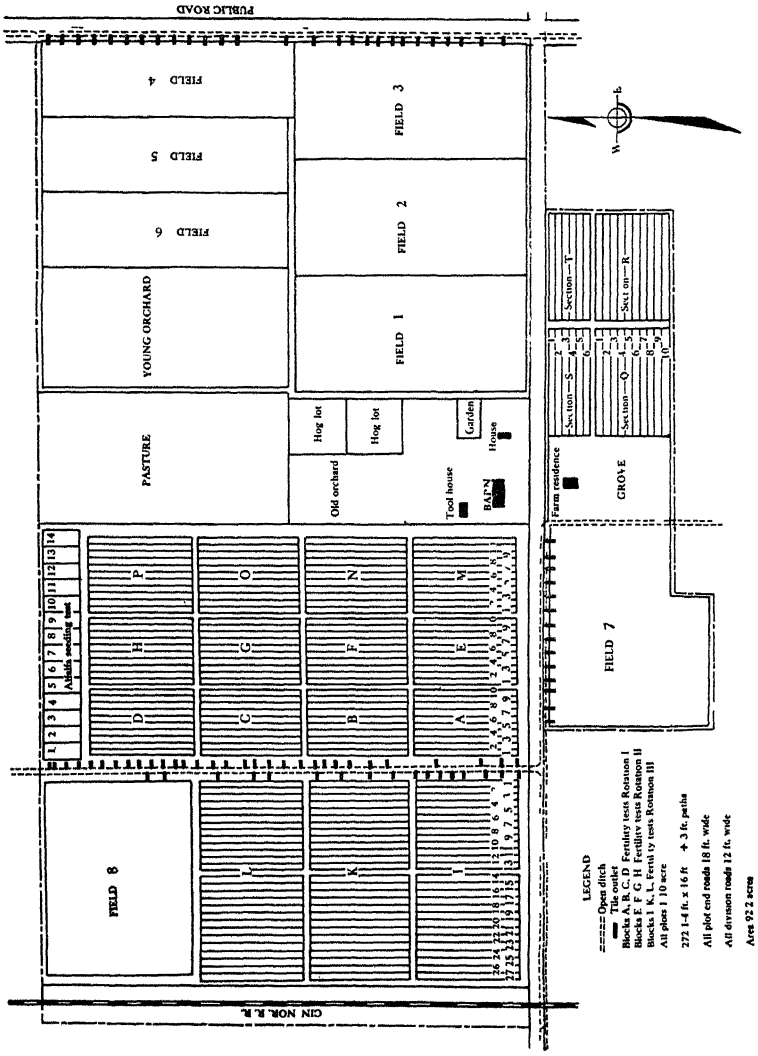
C. W. MONTGOMERY, CHIEF

FRANK M. LUTTS, SUPERINTENDENT
H. A. RAY, FOREMAN

PERSONNEL

Frank M. Lutts had charge of this farm as superintendent from July 1, 1917, to March 18, 1918, when he was succeeded by R. R. Barker.

New residence on the Paulding County Experiment Farm


PAULDING COUNTY EXPERIMENT FARM
Paulding, Ohio
PUBLIC ROAD
FIELD 4
FIELD 5
FIELD 6
YOUNG ORCHARD
FIELD 3
FIELD 2
FIELD 1
PASTURE
Hog lot
Hog lot
Garden
House
Old orchard
Tool house
BARN
Farm residence
GROVE
Section—T
Section—R
Section—S
Section—Q
FIELD 7
FIELD 8
CIN NOR. R. R.
LEGEND
Open ditch
Tile outlet
Blocks A, B, C, D Fertility tests Rotation I
Blocks E F G H Fertility tests Rotation II
Blocks I K, L Fertility tests Rotation III
All plots 1/10 acre
272 1-4 ft. x 16 ft + 3 ft. paths
All plot end roads 18 ft. wide
All division roads 12 ft. wide
Area 92.2 acres

PAULDING COUNTY STATISTICS

POPULATION (U. S. Census)

	1870	1880	1890	1900	1910
Total	8,544	13,485	25,932	27,528	22,730
White	8,069	12,838	25,047	26,758	22,228
Negro	475	647	867	766	502
Foreign born	654	743	1,095	933	675
Rural	.....	.....	.....	27,528	22,730

Population, 1910: Paulding, 2,081; Payne, 1,207; Antwerp, 1,187.

FARMS (U. S. Census)

	1880	1890	1900	1910
Approximate land area, Acres	.....	.....	.....	264,320
Land in farms, Acres	132,674	16,8570	248,303	255,609
Improved land in farms, Acres	59,400	9,4094	189,058	220,573
Woodland in farms, Acres	70,653	} 7,4476	59,245	} 26,498
Other unimproved land in farms, Acres	2,621	}		} 8,538
Total number of farms, Number	1,650	2,492	3,783	2,840
Area of average farm, Acres	80.4	67.6	65.6	90.0
Improved land per farm, Acres	36.0	37.8	50.0	77.7
Value of all property per farm, Dollars	1,998	2,726	2,936	9,918
Value of land and buildings per farm, Dollars	1,700	2,369	2,514	8,936
Value of land and buildings per acre, Dollars	21.14	35.04	38.32	99.29

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses, Number	668	1,870	3,256	4,262	5,353	5,995
Cattle, Number	2,632	5,537	7,382	9,289	6,625	7,519
Sheep, Number	714	5,132	5,471	6,417	6,127	7,814
Hogs, Number	4,704	7,245	7,247	8,152	8,588	12,086
Cattle equivalent { Total	3,842	8,645	11,910	15,008	13,449	15,504
Cattle equivalent { Per 1,000 acres	.....	.....	200	159	71	70

FARM CROPS: 10-year average production (Ohio statistics)

Decennium	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn, acres	2,810	4,690	9,656	13,565	32,121	46,710
Corn, Bushels	893,536	137,355	272,976	425,228	1,222,895	1,801,144
Corn, Bushels per acre	31.8	28.9	29.3	31.4	38.1	38.6
Oats, acres	345	861	3,026	4,248	9,013	31,603
Oats, Bushels	4,624	16,933	79,515	120,499	295,947	1,125,964
Oats, Bushels per acre	13.4	19.7	26.2	28.3	32.9	35.6
Wheat, acres	1,208	3,493	5,805	11,772	16,952	13,101
Wheat, Bushels	13,363	38,203	74,208	146,890	218,213	215,002
Wheat, Bushels per acre	11.1	10.9	12.8	12.5	12.9	16.4
Rye, acres	2-year av. 159	88	163	227	1,170	1,855
Rye, Bushels	1,474	951	199	3,512	10,215	34,312
Rye, Bushels per acre	9.2	10.8	12.2	15.5	8.8	18.5
Meadows, acres	1,777	2,919	4,480	8,025	13,013	17,554
Meadows, Tons	2,250	3,491	6,260	9,629	13,827	24,075
Meadows, Tons per acre	1.26	1.20	1.40	1.20	1.06	1.37
Clover, acres	.....	602	1,036	3,187	4,382	7,453
Clover, Tons	.....	638	1,158	2,704	3,934	8,973
Clover, Tons per acre	.....	1.06	1.12	.85	.90	1.20
Potatoes, acres	.....	247	586	630	718	466
Potatoes, Bushels	.....	18,849	32,356	43,230	60,928	36,934
Potatoes, Bushels per acre	.....	76.2	60.3	68.6	84.8	79.2
Orchards, acres	.....	810	1,269	1,864	2,040	1,608
Orchards, Apples, bushels	.....	14,515	21,205	39,087	34,490	34,174

CROP AND LABOR STATISTICS OF THE PAULDING COUNTY EXPERIMENT FARM FOR 1916

Area of farm, 92.2 acres
Area cultivated, 68.34 acres
Permanent pasture, 5.5 acres
Grove, 1.86 acres
Waste, 2.0 acres
Roads (farm), 6.0 acres
Roads (public), 4.5 acres
Miscellaneous, 4.0 acres

Crop	Number of plots	Total area	Total yield	Yield per acre
PLOT WORK		*Acres*	*Pounds*	
Corn	47	4.7	9,661	29.36 bu.
Oats	78	8.0	11,047.5	43.12 bu.
Barley	1	.1	71	14.79 bu.
Soybeans	16	1.6	990	10.31 bu.
Wheat*	10	1.0	150	2.5 bu.
Hay: timothy and clover	58	6.9	33,130	2.4 tons
Clover seed	38	4.5	214	.79 bu.
Sugar beets	27	2.7	26,662.8	4.94 tons
Not producing any crop: Block U	14	1.4	.....	.....
	289	30.9	.....	.....
Less plots producing two crops (hay and cloverseed)	38	4.5	.....	.....
Total	251	36.4	.....	.....
FIELD WORK				
Corn	.....	16.34	41,783	36.53 bu.
Oats	.....	11.89	14,065	36.96 bu.
Hay: timothy and clover	.....	4.46	16,485	1.85 tons
Apples: old orchard	.....	3.40	5,403	33.1 bu.
Unreported areas:				
Hog lots and garden (old orchard)	.....	1.60	.....	.....
Small fruit (young orchard)	.....	.67	.....	.....
Clover pasture (field No. 1)	.....	1.04	.....	.....
Not producing, 1916 (young orchard)	.....	4.25	.....	.....
Total crop acres	.....	74.52	.....	.....
Less part of grove cut for hay	1.2	.....	.....	.....
Less plots producing two crops	4.5	5.70	.....	.....
Total acres cultivated	.....	68.82	.....	.....
Less plot acres (30.87—4.5)	.....	26.37	.....	.....
Total field acres	.....	42.45	.....	.....

*Winter-killed.

RECEIPTS AND EXPENDITURES

RECEIPTS

From county treasury		$1,958.61
From farm sales:		
Livestock—horses $437.50; hogs $284.72	$722.22	
Grain and beans—wheat $48.63; oats $262.71; corn $45.66; soybeans $145.75; clover seed $118.75	621.50	
Forage and root crops—hay $143.86; straw $5.73; sugar-beets $61.40	210.99	
Truck crops—tomatoes	1.70	
Fruit—apples $75.27; cider $4.15	79.42	
Unclassified sales	5.80	
		1,641.63
Total receipts		$3,600.24

EXPENDITURES

For labor			$1,231.30
For current expense—seeds, etc. $40.78; spray materials $21.09; telephone and telegraph $18.21; transportation $10.78; postage $8; fuel and light $16.30; office furniture $29.91; advertising and exhibits $7.44; blacksmithing and repairs $18.55; insurance $4.60; unclassified $26.14			201.80
For machinery and tools			15.66
For permanent improvement:			
Buildings	$909.95		
Building material and construction—cement $35.15; gravel, etc. $12.50; lumber $634.99; painting $130.96; plumbing $235.53	1,049.13		
		$1,959.08	
Drainage		85.43	
			2,044.51
For livestock:			
Purchases—hogs		35.00	
Maintenance—feeds $40.72; veterinary, medicine, etc. $30.30		71.02	
			106.02
Total expenditures			3,599.29
Balance in county treasury February 28, 1917			.95
			$3,600.24

FINANCIAL SUMMARY

Total inventory and operating equipment

March 1, 1917

Land: 92 acres, original cost	$16,260.21	
Tile drainage, cost to date	1,023.32	
Total land and drainage		$17,283.53
Permanent improvements:		
Two dwellings, outhouses, walks	4,205.53	
Barns, corncribs, machine shed, hog and poultry houses	2,519.98	
Fences $326.09; watering system $195.02	521.11	
Orchard stock	19.65	
Total permanent improvements		7,266.27
Total permanent investment		$24,549.80
Operating equipment:		
Livestock: Two horses and two mules $875; 30 hogs $535	$1,410.00	
Implements, tools and harness	1,010.00	
Hog equipment, other than permanent:		
Feeder $6.60; 5 hog cotes and 2 floors $70.04; hog shade $13.65; port. corncrib $16.75; troughs $3.00; boar pen and yard $20.91; hog gates $4; wagon hog rack $5; hog crate $2	$141.95	
Hog watering system—not permanent	108.77	
	250.72	
Feeds—Hay $140; straw $15; corn $500; oats $300; tankage $16	971.00	
Seeds—Clover $40; timothy $1; alfalfa $2; soybeans $25; seed corn $60	128.00	
Fertilizer—Muriate of potash (300 lb.) $30; s. bone $2; nitrate of soda $5	37.00	
Containers—Bags $2; barrels $2; crates $7	11.00	
Office furnishings	25.00	
Sundry supplies—Oil $1; tile $5; lumber $20; spray material $16; brick and cement blocks $2; misc. small articles $10	54.00	
		$3,896.72
Total investment		$28,446.52

THE AGRICULTURAL CONDITIONS OF PAULDING COUNTY

F. M. LUTTS

The U. S. Census of 1910 gives the total area of Paulding County as 264,320 acres, of which 255,609 acres, or 96.7 percent, is in farms. Therefore, strictly speaking, Paulding is an agricultural county. The acre-value of these farms probably is relatively higher than in any other section of the State where land values are not influenced by the presence of nearby cities, large towns or trolley lines, there being none of these within the confines of the county. This being true the high value of its agricultural lands may be largely attributed to the capacity of the soil to produce large crops at a minimum cost.

Approximately 205,905 acres, or 77.9 percent, of the total area of the county is classed by the U. S. soil survey as Clyde clay, now called "Fulton clay" by the Ohio Soil Survey. This soil is a dark-colored, fine-textured material, water leveled over a tough, glacial till, which usually forms the lower subsoil and is therefore nearly level. It has the greatest amount of available plant food of all soils in the State. The average analysis for this class of soil, as found by the Experiment Station Chemist, in the first 7 inches, or the usual plow depth, and in the next 8 inches, is given in the following table in pounds per acre:

	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium
First 7 inches	7,440	1,958	46,726	18,586	14,348
Next 8 inches	3,800	1,446	52,600	16,650	15,772

Seventeen percent, or 44,943 acres, of the land in the county is classified in the Miami series of soils and is somewhat lighter in color, not quite so rich in either plant food or organic matter, and likely to be somewhat less level, although in this respect it can hardly be distinguished from the Clyde clay.

The Clyde clay and Miami soils, taken together, make up 94.9 percent of the total area of Paulding County. It is a rich, level, lake-laid plain, which was originally covered with a dense forest. The greater part of this forest, however, has been cleared away, and with the exception of a few scattering farm woodlots it has the appearance of a great, level prairie.

Having such a large area of land of uniform character it quite naturally follows that the same general style of farming prevails throughout the entire county. The large amount of available plant food present in the soil enables the farmers to practice short rotations and the high value of the land requires frequent money crops;

therefore a 2-year rotation of corn and oats is quite common. The oats are usually disked into the corn stubble land without previous preparation. Clover is sometimes sown with the oats for a plow-down crop for corn the following year. Clover alone, or clover and timothy, is sometimes sown with the oats and left for a crop of hay before being plowed down for corn, thus making a 3-year rotation of corn, oats and hay. A considerable area is devoted to raising sugar-beets for the sugar factory located at Paulding, and as oats do very well after beets and the ground is in excellent condition for a meadow, a beets-oats-hay rotation is commonly practiced.

Wheat is not extensively grown on the level, black land because of winter-killing, although it makes an excellent yield in favorable seasons. It is, however, grown to considerable extent on the loamy soils near the streams, where the surface drainage is somewhat better. The principal hay crop is clover, or clover and timothy mixed, medium red and alsike clover being the principal legumes grown for hay. Timothy alone is sometimes grown for hay and seed. Clover is largely cut for seed after the hay crop is removed. Mammoth clover is also grown quite extensively as a money crop and to plow down for corn after being harvested for seed. Alfalfa is not grown to any extent at present, as it does not seem to last a sufficient length of time to justify seeding it on the level clay soil.

Stock raising and dairying are not generally practiced, although large numbers of draft horses and hogs are kept. The latter have been diminishing somewhat in numbers the last few years on account of the ravages of hog cholera.

Fruit growing is not generally practiced and the family orchard is absent from a great number of farms. The heavy, level nature of the land is not well adapted to growing fruit trees and many farmers prefer to buy what fruit they need rather than to attempt to grow trees under adverse soil conditions and to combat the insect and fungus enemies that are so common. Small fruits are not grown to any extent although there is no good reason why they should not be found on every farm, so far as soil or climatic conditions are concerned.

DRAINAGE

Owing to the nature of the soil and to the level topography of the greater part of Paulding County, drainage is one of the principal problems, and is one that confronts nearly every farmer within its borders. For this reason it seems to be the logical mission of the county experiment farm to make investigations and experiments

in tile drainage. Large open ditches, located along nearly all highways and through the farms when necessary, are the means by which excess drainage water is taken from the farm lands. Surface drainage, however, is not sufficient to drain the land for farm purposes and tile drains are the common means of obtaining the desired results. Tile drains have been in use for many years and the trenches for such drains were formerly made with a ditching spade, but as the land is so nearly level it was difficult to get the proper grade. Many of these old drains have ceased to be of any value as they have, from one cause or other, become inoperative. Of late years the tile ditching machine, driven by steam or gasoline, has come into use and in the hands of a competent and careful operator the problem of a proper grade has been solved. There are, however, other problems in tile drainage in the particular kind of soil so prevalent in Paulding County that the machine does not solve, such as kinds of tile, depth to lay them, distance apart to lay the laterals, open or closed joints, etc.

Inquiry regarding tile drainage among the best-informed men of the county brings out the fact that there is a vast difference of opinion existing with regard to tile drain construction. With this difference of opinion and with the same type of soil prevailing to such a large extent it would seem logical to make extensive experiments at the experiment farm for the purpose of attempting to solve some of these difficult drainage problems. With this end in view a tile-drainage project was started in the fall of 1916, the preliminary steps being the locating of 10 test wells. One of these wells was put down close to a 4-inch tile drain about 35 inches deep. Another well was located 10 feet from the first, another 10 feet farther and so on for 80 feet back from the tile, the object of the experiment being to study the water table in its relation to tile drainage, keeping in mind the following features:

1. To determine the distance a tile drain will "draw" under given conditions.
2. To find the number of days during the year when the water table is above the level of the tile drain.
3. To ascertain the periods of the year when the water table is above the level of the tile drain.
4. To find the amount of rainfall necessary to raise the water table a given height.
5. To ascertain the rapidity of the rise and fall of the water table at different distances from the tile drains.

Later a 5-acre field will be devoted to tile drainage experiments along the lines indicated above and the behavior of the water table as shown by the test wells will, to a certain extent, influence the nature of the field experiments. These field experiments will be so installed that the products can be weighed from the different areas and the effect of tile drainage upon crop production thus determined. Possibly this experiment will be so made that the effect different crops and rotations have upon the physical conditions of the soil in connection with tile drainage, may be determined.

SOIL FERTILITY

Experiments at the farm show that the application of farm manure, as a rule, does not materially increase crop yields and this may be generally said of commercial fertilizers, except perhaps, in the case of complete fertilizers. Even complete fertilizers may not increase crop yields sufficiently to pay for the materials applied. The results of these experiments seem to indicate that the solution of the present problems of Paulding County farmers in increasing crop yields does not lie in the addition of available plant food elements to the soil and that other means must be taken to increase the productive capacity of the land.

It has been noted that the soil of Paulding County is well filled with available plant food, but while large crops are frequently grown the average acre yields, as shown by the assessor's statistics, do not seem to be consistent with the average land values. The following yields, with the exception of sugarbeets, which cover a period of 4 years, are the average for the 5 years, 1911 to 1915, inclusive, as computed from statistics collected by the township assessors. These 5 years are fairly representative ones in the matter of acreage, production and climatic conditions:

Five-year average yields per acre

Corn	Oats	Wheat	Clover	Meadow	Beets
44.8 bu.	38.9 bu.	20.2 bu.	1.1 T.	1.9 T.	8.3 T.

For many years a 2-year rotation of corn and oats has been practiced and doubtless this method has had a tendency to deplete the fine, clay soil of its organic matter and has thus caused it to become somewhat more compact than it was when nearer its virgin condition. Red clover or mammoth clover is now usually sown with the oats for a plow-down crop and these legumes probably have been the means of aiding drainage by making the soil more porous, but these clovers have become so subject to disease that some other

plant must be found to take their place if this short rotation is to be continued successfully.

With a view to comparing the clovers as plow-down crops, experiments were started in 1916 with a field test of red clover, mammoth clover and sweet clover. Under the extremely drouthy conditions that prevailed in the summer and fall of 1916 the sweet clover proved to be far superior to the other two. It grew the entire season and kept green until killed by frost, while the red and mammoth clovers felt the effects of the drouth to such an extent that some of the plants died entirely and others made no growth during the summer. The root development of the sweet clover was very deep but the dry condition of the ground prevented excavating to the extreme ends of the root system although many roots broke off at a depth of 2 feet; and, judging from the size of the roots where broken off, there is every reason to believe they penetrated the ground as deeply as the tiles are laid and that they will materially aid in draining the land and will improve its physical condition at the same time.

Sweet clover, so far as known, is not only drought resistant but also seems to be disease resistant, and if these virtues continue this humble legume is destined to become a valuable plant for Paulding County conditions and requirements. This first test was so favorable that further experiments, covering a series of years, will be continued with these three clovers with a view to determining, if possible, which is best for a plow-down crop in a 2-year rotation. Experiments are also planned to ascertain how these three clovers will compare in a 3-year rotation in the yield of corn, oats and hay. Several small plots will be devoted to this work and observations will be made as to how they affect the physical condition of the soil as well as to how they affect crop production.

EXPERIMENTS WITH HOGS

As has been previously stated, hog raising in the county has decreased in recent years because of the prevalence of hog cholera. However, being a corn county it is a logical place in which to grow hogs profitably; therefore, a tract consisting of about 30 acres was laid out in 1914 with a view to growing hogs as cheaply as possible by producing a series of crops that could be harvested by the hogs themselves. By this method a large portion of the manual labor would be eliminated in harvesting crops. A water system has been installed whereby water is conveyed by underground pipes directly to all fields and lots. The other equipment consists of a full com-

plement of "A" cotes, corncribs, hay feeder, self-feeder, shade, troughs and separate quarters for the male hog. The breeding stock consists of 10 purebred Duroc-Jersey sows and a purebred male, and it is expected that this herd will furnish enough pigs to carry on the work. Winter feeding will be carried on to determine whether this phase of the hog industry will pay under local conditions. The herd is in the hands of the State veterinarian, who will endeavor to keep it free from cholera by the simultaneous treatment of all pigs, and there is every reason to believe that much will be accomplished along this line and at a nominal cost.

SUGARBEET EXPERIMENTS

As sugarbeets are grown over considerable areas in the county a rotation into which beets were introduced was started the first year the farm was used for experimental purposes. Variety tests were started at first but as the sugar factory managers furnished their patrons with the variety of seed best suited to their needs, or such kinds as could be obtained, this project was discontinued.

The present enterprise with sugarbeets consists of fertility tests in a beets-oats-clover rotation, there being 27 tenth-acre plots devoted to this work.

ORCHARD AND SMALL FRUITS

As originally planned, about 5 acres was to be devoted to orcharding and a commercial and variety apple orchard was set. The variety portion of the orchard has been abandoned for the present, owing to the fact that tree hoppers attacked the young trees when first set and damaged them to such an extent that it was deemed advisable to remove them. That portion of the orchard devoted to commercial purposes will be maintained as it is in fairly good condition and gives promise of developing into a good bearing orchard.

A small fruit garden was set in the spring of 1916, and considering the extreme drouth made good growth with but a few fatalities to the plants. The plants set consisted of three varieties of currants, two of gooseberries, two of blackberries, two each of red and black raspberries and one of strawberries. Several more varieties of strawberries would have been planted but the plants could not be obtained in time to do so. The object of this experiment is to ascertain which varieties are adapted to Paulding County soil conditions.

NEW PLOT WORK

Besides the sweet clover plot work previously mentioned the new plot work started in 1916 consisted of 12 plots devoted to a comparison of floats (finely ground rock phosphate) and acid phosphate as carriers of phosphorus. Plots 1 and 2 are checks, Plot 1 being a check on the ditch; Plots 3 and 4 for the two carriers alone; Plots 6 and 7 are for the two carriers with 1,000 pounds of ground limestone added; Plots 9 and 10 are for the two carriers with 8 tons of yard manure added; Plot 12 is for floats alone which is to be applied in the fall before plowing the land. Plots 5, 8 and 11 also are checks.

CLIMATIC CONDITIONS

The climatic conditions were very unfavorable to crop planting and to crop production during the spring and summer of 1916. The precipitation for January, February, March and April was 9.84 inches, or about normal. For May and June the precipitation was 11.99 inches or 5.59 inches above normal. The last rain of any consequence fell on June 29 and the precipitation for July, August and September, or the balance of the growing season, was only 4.08 inches, or 1.51 inches below normal. The precipitation during these 3 months consisted principally of light showers which were quickly absorbed by the parched ground and evaporated by the extreme heat which prevailed during July and August. The crop situation was also aggravated by the ground cracking very deeply, which allowed much needed moisture to escape into the air and the heated air to enter the ground.

The excessive spring rains delayed planting corn, soybeans and beets and injured the oats and hay to some extent. A killing frost on the night of September 23 prematurely ripened the late-planted corn and soybeans on some of the plots, which rendered them useless for crop records.

FINANCIAL STATEMENT

An effort has been made to determine the total expenditures for permanent improvements since the purchase of the farm in 1911. For the first few years of its operation no detailed accounts were kept either of the cost of materials and construction or of the amount of farm labor expended thereon, so that the cost of a number of constructions has had to be estimated. Comprehensive cost accounts of each item of permanent improvement are now being kept on all of the county experiment farms, publication of which began in the annual report of county experiment farms for 1915 (Bul. 303). Such an account follows for the Paulding County Farm up to 1916.

PERMANENT IMPROVEMENTS

The permanent improvements completed in 1916 were a 7-room residence with basement; a warm air furnace; a pneumatic water system complete with tank, pump, bath room outfit; hot water system, pipes, faucets and cistern connection; a 110-barrel concrete cistern; a concrete septic tank for sewage disposal; a cellar drain; a hog cote and yard for male hog, and 272 rods of tile drains, the cost of which follows:

PERMANENT INVESTMENT

(Including original purchase and cost of improvement to date)

Original cost of farm				$16,260.21
Permanent improvements:				
Buildings:				
Item	Year	Cost Actual	Cost Estimated†	
Dwelling No. 1	1916	$2,993.63*		
Dwelling No. 2	1911		732.55	
Summer kitchen	1913		390.25	
Barn No. 1	1911		1,834.23	
Two metal corncribs	1912		150.00	
Hen house	1912		65.00	
Out house	1912		10.00	
Concrete walk	1912		39.10	
Machine shed	1914	225.00		
Outhouse and coal house			40.00	
				$6,479.76
Tile drainage:				
	1911		286.60	
	1912		120.88	
	1914	471.59		
	1916	144.25		
				$1,023.32
Hog equipment:				
Watering system	1914	195.02		
Fence	1914	301.09		
Material for hog house	1914	175.00		
				$671.11
Miscellaneous:				
Repairing and reinforcing barn	1913	70.75		
Nursery stock	1912	8.70		
Nursery stock	1913	10.95		
Fence and posts	1912	16.00		
Fence and posts	1913	9.00		
				$115.40
				$8,289.59
Total				$24,549.80

*Including plumbing, cellar foundation, cellar drain, septic tank and cistern.
†In all estimated items no allowance is made for hauling of material by farm teams nor for regular farm labor expended.

THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Four rotations are being conducted on the Paulding County Experiment Farm, namely:

Rotation I: Corn, oats, wheat, clover.
Rotation II: Corn, soybeans, wheat, clover.
Rotation III: Sugarbeets, oats, clover.
Rotation IV: Corn, oats. (Begun in 1915.)

Rotations I and II are duplicates in treatment of the similar rotations in Miami County, and were begun in 1912, as was also Rotation III. The plans of fertilizing in Rotations I and II are shown in Table 19, and those of Rotations III and IV in Tables 23 and 24. The arrangement of plots in Rotations I, II and III is shown in the accompanying diagram, and the outcome of the first 4 years' work is shown in the tables which follow.

TABLE 19.—Plan of fertilizing, Paulding County Experiment Farm

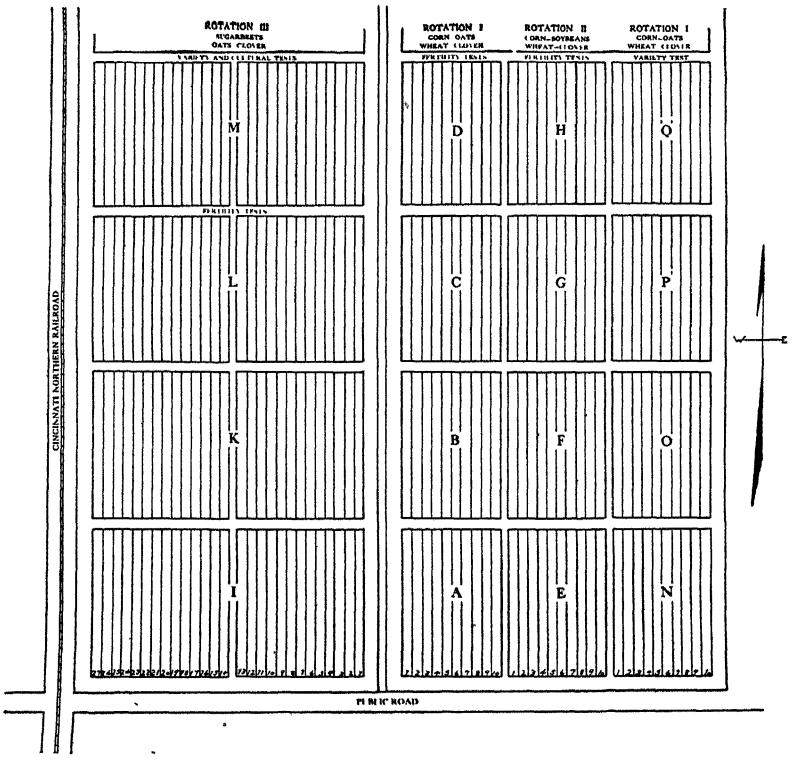
Pounds of fertilizing materials per acre for each crop

Plot	On corn				On oats			On wheat		
	Acid phosphate	Muriate potash	Nitrate soda	Additional treatment	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
Rotation I: Corn-oats-wheat-clover										
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	200	50	50	*	100	20	30	200	20	80
7										
8	Manure, 8 tons							200	50	50
9	Manure, 8 tons, phosphated							200	50	50
10										
Rotation II: Corn-soybeans-wheat-clover										
	On corn				On soybeans			On wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
9	130	50	20		70	20	10	160	20	20
7										
8	160	20	20		100			170		30
9	160	20	20	†	100			170		30
10										

*Sugar factory lime, 2 tons. †Catch crop to follow corn.

Fertilizers and manure on corn.—Six corn crops have been grown in Rotations I and II, with as yet no evidence of any benefit from the fertilizers. On the contrary, the outcome would seem to indicate injury, rather than benefit.

It is difficult to understand this outcome, for the crop yields have not been so large but that some further increase was possible. The unfertilized yields in the average of the two rotations are nearly the same as those in the corresponding Miami County tests, but whereas the land treated with acid phosphate alone has reached a 7-year average of 61 bushels per acre in the Miami County test, the yield from the same treatment has averaged only 46 bushels in the Paulding County test. Untreated manure has brought up the yield to 60 bushels and phosphated manure to 67 bushels in Miami County, while the same treatments in Paulding County have produced 47 bushels and 51 bushels, respectively. Acid phosphate has apparently reduced the yield in Paulding County, both when used alone and when mixed with manure.



Arrangement of plots, Paulding County Experiment Farm. Plots one-tenth acre. Tile drains are laid east and west across these plots about 5 rods apart, emptying into the large open ditch running north and south through the middle of the tract

TABLE 20.—Fertilizers and manure on CORN, Paulding County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916				1917				Average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
	Rotation I: Corn-oats-wheat-clover	Block B				Block C				6-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	29.29	2,850			73.57	4,950			50.52	3,571			1
2	Acid phosphate, 200 lb	27.57	2,620	— 1.86	— 320	67.86	5,300	—6.42	50	47.48	3,637	—4.22	— 45	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	27.14	3,100	— 2.43	70	69.29	5,800	—5.71	250	47.30	4,010	—5.57	217	3
4	None	29.71	3,120			75.71	5,850			54 03	3,903			4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	28.43	3,110	— .85	93	76.43	6,150	1.43	550	53.36	4,122	.08	303	5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; sugar factory lime, 2 tons	23.86	2,330	— 5.00	— 583	72.14	5,900	—2.14	550	48.59	3,872	—3.92	136	6
7	None	28.43	2,810			73.57	5,100			51.75	3,652			7
8	Untreated manure, 8 tons	25.00	2,450	— 3.33	— 300	72.14	4,900	.71	— 83	51.46	3,627	.25	— 14	8
9	Phosphated manure, 8 tons	21.86	2,470	— 6.38	— 220	72.14	5,100	2.86	233	47.12	3,897	—3.56	266	9
10	None	28.14	2,630			67.14	4,750			50.15	3,620			10
	Average unfertilized yield	28.89	2,852			72.50	5,162			51.61	3,686			
	Rotation II: Corn-soybeans-wheat-clover	Block F				Block G				5-year average				
1	None	28.29	2,470			70.71	4,900			48.57	3,406			1
2	Acid phosphate, 200 lb	27.57	2,220	— 2.48	— 510	68.57	4,800	—1.67	—117	44.97	3,344	—3.68	— 94	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	26.43	2,650	— 5.38	— 340	69.29	5,000	— .47	67	44.34	3,494	—4.38	24	3
4	None	33.57	3,250			69.29	4,950			48.80	3,502			4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	26.71	2,880	— 7.10	— 603	72.14	5,400	2.38	400	50.28	3,846	.38	192	5
6	Acid phos., 130 lb.; mur. potash, 50 lb.; nitrate soda, 20 lb.	24.71	2,870	— 9.34	— 847	69.29	5,350	— .95	300	46.86	3,634	—4.15	—173	6
7	None	34 29	3,950			70.71	5,100			52.11	3,959			7
8	Acid phos., 160 lb.; mur. potash, 20 lb.; nitrate soda, 20 lb.	31.71	3,630	— 4.44	— 623	70.00	5,650	.24	500	50.26	4,094	—1.94	126	8
9	Acid phos., 160 lb.; mur. potash, 20 lb.; nitrate soda, 20 lb.	27.00	2,860	—11.00	—1,697	72.14	5,400	3.33	200	49.61	3,898	—2.66	— 79	9
10	None	39.86	4,860			67.86	5,250			52.36	3,986			10
	Average unfertilized yield	34.00	3,632			69.64	5,050			50.46	3,713			

Fertilizers and manure on oats.—The 6-year average unfertilized yield has been 52.46 bushels in the cereal rotation and 49.43 bushels after sugarbeets. Acid phosphate seems to have diminished the yield in both rotations when used alone, while nitrate of soda has apparently produced an increase whether used alone or in combination. In the beet rotation there has been a gain from the combination of acid phosphate and muriate of potash notwithstanding the loss following each material when used separately. In this rotation the results indicate a tendency toward consistent increase from the use of fertilizers, although they are still too irregular to justify any attempt to formulate definite conclusions.

In the duplicate cereal rotation in which oats follows corn on the Miami County Experiment Farm the unfertilized yield of oats has averaged 47 bushels per acre for the same 6-year period, which has been increased by 6 to 11 bushels by the various treatments, the average results showing a large and consistent increase for each treatment.

Fertilizers and manure on wheat.—The wheat in both the Paulding County tests was destroyed by winter killing in 1916 and 1917. Oats were sown in Rotation I, with the outcome shown in Table 22, which shows the same unfavorable effect of acid phosphate. Rotation II was not sown to oats in 1916, in the hope that there might be some wheat left, but the quantity was so small that the plots were not harvested separately. The results for 1917 indicate a considerable increase from the fertilizers.

Fertilizers and manure on soybeans.—The soybeans, like the corn and oats, have apparently been indifferent to fertilizing, although the yield has not been near the upper limit of the possible production of this crop.

Fertilizers and manure on sugarbeets.—The sugarbeets made less than half a crop in 1916, owing to the drouth. No increase is shown for either acid phosphate or muriate of potash when used alone, although when combined with each other the apparent increase is over 2½ tons per acre. In 1917 the yield was good, with a regular increase from the fertilizers.

Nitrate of soda has apparently caused a decided increase of crop when used alone, and a still larger increase when combined with both acid phosphate and muriate of potash, the increase from this combination, notwithstanding the high cost of the fertilizers, giving a larger net return than any other treatment.

Sugar factory lime appears to be of no advantage to the beet crop on this soil, and a decided disadvantage to the clover following the beets.

TABLE 21.—Fertilizers and manure on OATS and SOYBEANS following corn, Paulding County Experiment Farm
Yield and increase per acre

Plot	Treatment per acre	1916				1917				6-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	OATS: in corn-oats-wheat-clover rotation	Block A				Block B				6-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	59.16	3,660			66.87	3,960			53.97	3,290			1
2	Acid phosphate, 100 lb	52.50	2,670	—4.44	—793	71.56	4,860	5.00	773	52.84	3,234	—1 00	— 70	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	53.12	2,800	—1.60	—467	70.62	4,490	4.37	277	54.74	2,962	1.03	—355	3
4	None	52.50	3,070			65.94	4,340			53.57	3,332			4
5	Acid phos., 100 lb.; mur; potash, 20 lb.; nitrat soda, 30 lb.	52.50	3,045	1.15	72	67.81	4,630	1.87	207	56.46	3,193	3.78	— 26	5
6	Acid phos., 100 lb.; mur. potash, 20 lb.; nitrate soda, 30 lb.	54.69	2,550	4.48	—327	64.69	3,880	—1.25	—627	54.95	3,005	3.15	—103	6
7	None	49.06	2,780			65.94	4,590			50.91	2,996			7
8	Untreated manure on corn	46.87	2,600	—4.17	—233	60.62	4,560	—3.65	— 50	49.37	3,066	—1.47	82	8
9	Phosphated manure on corn	47.50	2,330	—5.52	—557	66.56	5,420	3.95	790	49.74	2,912	— .63	—140	9
10	None	55.00	2,940			60.94	4,650			51.41	3,155			10
	Average unfertilized yield	53.93	3,112			64.92	4,385			52.46	3,193			
	SOYBEANS: in corn-soybeans-wheat-clover rotation	Block E				Block F				6-year average				
1	None	12.33	1,260			18.33	2,800			17.25	1,935			1
2	Acid phosphate, 100 lb	13.33	1,100	.83	—283	19.00	2,560	1.22	—407	17.88	1,766	.60	—252	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	12.83	2,030	.17	523	19.50	3,080	2.28	— 53	18.52	2,202	1.20	100	3
4	None	12.83	1,630			16.67	3,300			17.35	2,186			4
5	Acid phos., 100 lb.; mur. potash, 20 lb.; nitrate soda, 30 lb.	14.00	1,810	.39	153	18.00	2,620	1.00	—393	18.58	2,182	1.04	66	5
6	Acid phos., 70 lb.; mur. potash, 20 lb.; nitrate soda, 10 lb.	14.17	2,030	— .22	347	18.67	2,680	1.33	— 45	18.19	2,151	.44	105	6
7	None	15.17	1,710			17.67	2,440			17.94	1,976			7
8	Acid phosphate, 100 lb	15.50	1,850	.39	143	19.00	2,960	1.05	370	19.27	2,154	1.16	131	8
9	Acid phosphate, 100 lb.*	15.67	1,660	.61	— 43	19.67	2,970	1.45	230	19.34	2,180	1.06	112	9
10	None	15.00	1,700			18.50	2,890			18.45	2,114			10
	Average unfertilized yield	13.83	1,575			17.79	2,857			17.74	2,066			

*Catch crop after corn.

TABLE 22.—Fertilizers and manure on OATS, grown in place of wheat, Paulding County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916				1917				2-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-oats-wheat-clover	Block D				Block A								
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	40.94	2,490	.....	.....	58.44	3,930	.....	.....	49.69	3,210	.....	.....	1
2	Acid phosphate, 200 lb.	37.50	1,500	—5.00	—958	60.94	3,300	2.40	—527	49.22	2,400	—1.30	—742	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb.	39.06	1,950	—5.00	—477	58.75	3,120	.10	—603	48.90	2,535	—2.45	—540	3
4	None	45.62	2,395	.....	.....	58.75	3,620	.....	.....	52.18	3,007	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	45.94	2,780	1.15	443	62.19	3,260	3.34	—140	54.06	3,020	2.24	151	5
6	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	40.94	2,540	—3.01	262	59.37	3,200	.41	20	50.15	2,870	—1.30	141	6
7	None	43.12	2,220	.....	.....	59.06	2,960	.....	.....	51.09	2,590	.....	.....	7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	47.19	2,840	4.59	603	60.62	3,010	2.39	—93	53.90	2,925	3.49	255	8
9	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	46.87	2,500	4.79	247	62.19	3,010	4.80	—237	54 53	2,755	4.79	5	9
10	None	41.56	2,270	.....	.....	56.56	3,390	.....	.....	49.06	2,830	.....	.....	10
	Average unfertilized yield	42.81	2,344	.....	.....	58.20	3,475	.....	.....	50.50	2,909	.....	.....	
	Rotation II: Corn-soybeans-wheat-clover	Block H				Block E								
1	None					60.94	4,100	.....	.....					1
2	Acid phosphate, 200 lb.					66.25	4,330	4.27	230					2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb.					68.12	4,620	5.10	520					3
4	None					64.06	4,100	.....	.....					4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.					67.50	4,190	5.00	23					5
6	Acid phos., 160 lb.; mur. potash, 20 lb.; nitrate soda, 20 lb.					67.81	4,230	6.88	—3					6
7	None					59.37	4,300	.....	.....					7
8	Acid phosphate, 170 lb.; nitrate soda, 30 lb.					69.06	4,190	8.44	—37					8
9	Acid phosphate, 170 lb.; nitrate soda, 30 lb.					71.25	4,370	9.38	217					9
10	None					63.12	4,080	.....	.....					10
	Average unfertilized yield					61.87	4,095	.....	.....					

TABLE 23.—Fertilizers and manure on SUGARBEETS, Paulding County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916—Block L		1917—Block I		6-year average		Plot
		Yield	Increase	Yield	Increase	Yield	Increase	
		Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	
1	None	5.515		15.430		12.570		1
2	Acid phosphate, 600 lb	4.865	— .042	14.975	— .113	12.515	117	2
3	Muriate potash, 200 lb	3.140	—1.158	14.210	— .537	10.717	—1.509	3
4	None	3.690		14.405		12.053		4
5	Nitrate soda, 200 lb	5.650	1.990	14.890	1.167	12.761	1.239	5
6	Acid phosphate, 600 lb.; nitrate soda, 200 lb	5.125	1.495	14.525	1.483	12.454	1.463	6
7	None	3.600		12.360		10.460		7
8	Acid phosphate, 600 lb.; muriate potash, 200 lb	5.975	2.525	16 610	4.487	13.318	3.078	8
9	Muriate potash, 200 lb.; nitrate soda, 200 lb	4.725	1.425	13.880	1.993	12.001	1.981	9
10	None	3.150		11.650		9.800		10
11	Acid phosphate, 600 lb.; muriate potash, 200 lb.; nitrate soda, 200 lb	6.075	2.792	15.460	4.073	14.022	3.925	11
12	Acid phos., 600 lb.; mur. potash, 200 lb.; nit. soda, 200 lb.; sugar factory lime, 2 tons.	5.900	2.483	15.750	4.627	14.029	3.633	12
13	None	3.550		10.860		10.693		13
14	Sugar factory lime, 2 tons	5.485	1.798	14.330	3.497	*10.083	1.032	14
15	Floats, 1,200 lb	4.910	1.087	15.530	4.728	*10.198	1.200	15
16	None	3.960		10.775		*10.839		16
17	Yard manure, 10 tons	4.930	.813	16.855	5.738	12.897	1.960	17
18	Fresh manure, 10 tons	5.830	1.557	14.500	3.042	13.609	2.573	18
19	None	4.430		11.800		11.134		19
20	Fresh manure, 10 tons; sugar factory lime, 2 tons	5.905	.795	15.245	2.757	13.304	1.721	20
21	Fresh manure, 10 tons; acid phosphate, 300 lb	7.095	1.305	15.845	2.668	14.002	1.969	21
22	None	6.470		13.865		*12.902		22
23	Mixed fertilizer, 2-8-2, 500 lb	6.390	.753	15.170	1.832	*13.547	1.195	23
24	Acid phosphate, 287 lb.; muriate potash, 20 lb.; nitrate soda, 52 lb	6.490	1.687	18.885	6.073	*13.785	1.984	24
25	None	3.970		12.285		*11.251		25
26	Acid phosphate, 300 lb.; muriate potash, 100 lb. nitrate soda, 100 lb	5.840	1.870	17.195	4.910	*13.217	1.966	26
27	Steamed bonemeal, 175 lb.; muriate potash, 100 lb.; nitrate soda, 67 lb	5.640	1.670	15.885	3.600	*14.490	3.239	27
	Average unfertilized yield	4.259		12.603		11.268		

*5 years

TABLE 24.—Residual effect on OATS of treatment of previous sugarbeet crop. Paulding County Experiment Farm

Plot	Treatment per acre, on soybeans only	1916—Block K				1917—Block L				6-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	33.12	1,790			64.06	6,200			52.05	3,976			1
2	Acid phosphate, 600 lb	26.25	1,410	—6.87	—380	65.94	5,540	3.23	—287	48.72	3,175	—2.77	—650	2
3	Muriate potash, 200 lb	23.44	1,400	—9.68	—390	66.25	4,680	4.90	—773	48.59	3,157	—2.35	—516	3
4	None	33.12	1,790			60.00	5,080			50.39	3,522			4
5	Nitrate soda, 200 lb	45.31	2,650	10.83	710	59.69	5,740	—1.66	720	50.67	4,025	.64	631	5
6	Acid phosphate, 600 lb.; nitrate soda, 200 lb	55.00	3,190	19.17	1,100	65.00	5,970	2.29	1,010	54.22	3,681	4.54	416	6
7	None	37.19	2,240			64.06	4,900			49.32	3,137			7
8	Acid phosphate, 600 lb.; muriate potash, 200 lb	43.75	3,000	8.75	950	67.19	5,850	4.17	1,067	53.46	3,869	5.01	787	8
9	Muriate potash, 200 lb.; nitrate soda, 200 lb	35.16	2,025	2.35	165	58.44	5,030	—3.54	363	47.58	3,511	—.01	484	9
10	None	30.62	1,670			60.94	4,550			46.72	2,972			10
11	Acid phos., 600 lb.; mur. potash, 200 lb.; nit. soda, 200 lb.	42.19	2,650	7.51	777	64.37	5,840	4.99	1,423	50.78	3,901	3.77	777	11
12	Acid phos., 600 lb.; mur. potash, 200 lb.; nit. soda, 200 lb.; sugar factory lime, 2 tons	53.12	3,300	14.37	1,223	59.69	5,090	1.88	807	53.83	3,836	6.54	560	12
13	None	42.81	2,280			56.25	4,150			47.58	3,428			13
14	Sugar factory lime, 2 tons	41.56	2,520	—.21	457	59.69	4,490	2.29	260	47.16	2,951	2.04	—1	14
15	Floats, 1,200 lb	45.94	2,000	5.21	153	57.50	4,910	—1.04	600	52.14	3,632	4.87	465	15
16	None	39.69	1,630			59.69	4,390			47.12	3,035			16
17	Yard manure, 10 tons	44.06	2,490	3.54	737	61.25	4,940	.94	553	48.84	3,257	3.99	457	17
18	Fresh manure, 10 tons	39.06	2,000	—2.30	123	60.94	5,200	0	817	46.50	3,118	.88	223	18
19	None	42.19	2,000			61.56	4,380			46.37	2,990			19
20	Fresh manure, 10 tons; sugar factory lime, 2 tons	35.94	1,850	—5.21	—217	60.94	4,750	—.20	157	47.16	3,017	1.14	0	20
21	Fresh manure, 10 tons; acid phosphate, 300 lb	40.94	2,440	.84	307	60.31	5,270	—.42	463	46.31	3,403	.66	359	21
22	None	39.06	2,200			60.31	5,020			45.29	3,071			22
23	Mixed fertilizers, 2-8-2, 500 lb	41.56	2,270	4.37	260	65.31	4,660	6.35	97	48.97	3,203	3.54	253	23
24	Acid phos., 287 lb.; mur. potash, 100 lb.; nit. soda, 52 lb.	32.50	1,960	—2.81	140	66.87	5,060	9.27	953	46.16	3,009	.60	180	24
25	None	33.44	1,630			56.25	3,650			45.69	2,708			25
26	Acid phos., 300 lb.; mur. potash, 100 lb.; nit. soda, 100 lb.	38.44	2,970	5.00	1,340	66.56	4,570	10.31	920	47.44	3,138	1.75	430	26
27	Steamed bonemeal, 175 lb.; mur. pot., 100 lb.; nit. soda, 67 lb.	29.06	1,820	—4.38	190	55.62	4,270	—.63	620	43.90	2,755	—1.78	47	27
	Average unfertilized yield	40.24	2,121			60.35	4,702			49.43	3,356			

Residual effect of fertilizers and manure on clover.—Table 25 reports the clover crops in the different rotations and shows a yield averaging 3 tons per acre on the unfertilized land and reaching 3½ tons on the manured land. With clover, as with the other crops, the yields have been too irregular to justify the assumption that the fertilizers or manure have produced any material effect.

The sugar factory lime, as used in Rotation III, has injured, instead of benefiting the clover, the injury being so great as to be evident during the growth of the clover. The addition of the same lime to the complete fertilizer in Rotation I has also been followed by a slight reduction in the yield of clover.

It was not unexpected that this soil would fail to give any increase for lime, as the luxuriant growth of clover indicates a good supply of this constituent, but the apparently unfavorable effect is not yet understood.

A 2-YEAR ROTATION OF CORN AND OATS

A practice which is sometimes followed is to grow corn and oats in a 2-year rotation, husking the corn on the stalk, sowing clover in the oats and turning it under the next spring for corn. A rotation of this kind was begun in 1915, two blocks of 10 plots each being employed, with the treatment shown in Table 26.

In 1916 the stand of corn in this experiment was so defective that the plots were not harvested separately. The record for the two crops each of corn and oats thus far harvested is given in the table.

In this experiment also acid phosphate, when used alone or with muriate of potash only, seems to reduce the yield, while the complete fertilizers and manure show small increases. It is much too early yet, however, to attempt to draw conclusions.

Comparison of two typical soils.—It is interesting to compare the results thus far attained on the soils of the Miami and Paulding County Experiment Farms, the one representing the yellowish Miami clay loam and its alternating darker patches of Clyde clay loam; the other the Clyde clay, renamed Fulton clay, the dark brown, heavy, water-leveled clay characterizing a large part of the ancient lake bed in northwestern Ohio.

The Miami County farm has been in cultivation for a much longer period than the one in Paulding County, which was covered with elm and similar wet-land timber until probably about 30 years ago. Only the main drains have as yet been constructed on the Miami County Farm. Tile drains have been laid about 5 rods apart under the Paulding County land, but there should be at least twice as many.

TABLE 25.—Residual effect on CLOVER, of treatment of previous crops in rotation. Paulding County Experiment Farm. Fertilizing materials and yield and increase of crop in pounds per acre

Plot	Fertilizing materials on previous crops					Yield and increase of crop					
						1916		1917		Average	
	Acid phosphate	Muriate potash	Nitrate soda	Lime	Manure	Yield	Increase	Yield	Increase	Yield	Increase
Rotation I—Corn-oats-wheat-clover						Block C		Block D		4-year average	
1						4,933		4,674		5,260	
2	500					5,378	460	5,642	645	5,729	300
3	500	90				6,089	1,185	5,474	155	6,092	494
4						4,889		5,642		5,766	
5	500	90	160			6,134	845	5,179	—340	6,379	517
6	500	90	160	4,000		5,600	— 89	5,516	119	6,132	172
7						6,089		5,274		6,056	
8	200	50	50		8 tons	5,778	—474	6,148	569	6,837	681
9	[1]520	50	50		8 tons	6,356	— 59	6,527	643	6,515	260
10						6,578		6,189		6,353	
Average unfertilized yield						5,622		5,455		5,861	
Rotation II—Corn-soybeans-wheat-clover						Block G		Block H		4-year-average	
1						5,467		4,758		5,476	
2	500					6,222	652	6,442	814	6,486	621
3	500	90				5,199	—475	6,526	28	6,257	2
4						5,777		7,368		6,664	
5	500	90	160			5,600	— 14	6,568	—704	6,361	—202
6	360	90	50			5,867	415	6,273	—309	6,641	157
7						5,289		6,189		6,403	
8	430	20	50			5,645	296	6,315	210	6,579	219
9	430	20	50			5,600	193	5,431	—590	6,263	— 53
10						5,467		5,937		6,272	
Average unfertilized yield						5,499		6,063		6,199	
Rotation III—Sugarbeets-oats-clover						Block I		Block K		5-year average	
1						5,378		4,379		6,917	
2	600					5,422	15	5,347	786	6,833	— 75
3		200				4,178	—1,259	4,589	—155	6,339	—499
4						5,466		4,926		7,038	
5			200			4,800	—533	5,221	112	6,851	— 64
6	600		200			4,844	—355	4,632	—659	6,285	—505
7						5,066		5,474		6,666	
8	600	200				5,466	815	5,053	—393	6,774	346
9		200	200			4,444	207	5,558	141	6,525	337
10						3,822		5,389		5,948	
11	600	200	200			5,600	1,437	6,316	857	7,720	1,444
12	600	200	200	4,000		5,422	919	5,389	—141	6,150	—453
13						4,844		5,600		6,931	
14				4,000		4,178	—651	5,558	14	5,836	—817
15	[2]					4,222	—593	5,895	407	7,127	752
16						4,800		5,432		6,098	
17					[3]10 tons	5,200	686	5,642	252	7,162	926
18					[4]10 tons	4,533	305	6,105	758	6,482	109
19						3,942		5,305		6,511	
20				4,000	[4]10 tons	3,902	0	5,432	— 98	6,170	—223
21	300				[4]10 tons	3,862	0	5,642	—112	6,159	—117
22						3,822		5,979		6,159	
23	[5]					4,311	444	5,432	—266	6,290	278
24	287	100	52			4,267	356	5,558	140	6,010	146
25						3,956		5,137		5,717	
26	300	100	100			3,867	— 89	5,875	758	6,041	324
27	[6]	100	67			4 133	177	5,768	631	6,126	409
Average unfertilized yield						4,607		5,291		6,451	

[1]Including 320 lb. acid phosphate in phosphated manure.
[2]Raw phosphate rock, 1,200 lb.
[3]Yard manure.
[4]Fresh manure.
[5]Mixed fertilizer (2-8-2) 500 lb.
[6]Steamed bonemeal, 175 lb.

TABLE 26.—Fertilizers, lime and manure on CORN and OATS grown in 2-year rotation. Paulding County Experiment Farm

Yield and increase per acre

Plot	Treatment per acre—all on corn	1916 Yield		1916 Increase		1917 Yield		1917 Increase		2-year average Yield		2-year average Increase		Plot
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Corn	1915—Block Q				1917—Block Q				2-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	52.86				55.71				54.28				1
2	Acid phosphate, 200 lb	66.43		7.86		47.14		—7.86		56.78		0		2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	66.43		2.14		52.86		—1.42		59.64		.36		3
4	None	70.00				53.57				61.78				4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	65.71		—.96		62.86		11.67		64.28		5.35		5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; lime, 2 tons	71.72		8.39		66.43		17.62		69.07		13.00		6
7	None	60.00				46.43				53.21				7
8	Untreated manure, 8 tons	72.85		8.33		62.86		10.00		67.85		9.16		8
9	Phosphated manure, 8 tons	75.71		6.66		63.57		4.29		69.64		5.47		9
10	None	73.57				65.71				69.64				10
	Average unfertilized yield	64.11				55.36				59.73				
	Oats	1916—Block Q				1917—Block R				2-year average				
1		55.62	1,670			55.62	4,220			55.62	2,945			1
2		32.19	1,320	—17.18	—383	59.37	4,200	2.71	163	45.78	2,760	—7.23	—110	2
3		35.62	1,660	—7.50	—77	57.81	4,150	.10	297	46.71	2,905	—3.70	110	3
4		36.87	1,770			58.75	3,670			47.81	2,720			4
5	No treatment on oats	34.37	1,600	1.87	107	56.56	3,840	—1.67	170	45.46	2,720	.10	138	5
6		41.25	1,980	13.13	763	60.94	4,150	3.23	480	51.09	3,065	8.18	621	6
7		23.75	940			57.19	3,670			40.47	2,305			7
8		36.87	1,570	10.10	477	57.50	3,960	.42	170	47.18	2,765	5.26	323	8
9		40.62	1,850	10.83	603	60.31	4,420	3.33	510	50.46	3,135	7.08	556	9
10		32.81	1,400			56.87	4,030			44.84	2,715			10
	Average unfertilized yield	37.27	1,445			57.11	3,897			47.19	2,671			

Rotations I and II receive the same treatment on the two experiment farms and the average unfertilized yields of corn in the two experiments for the 6 years of the Paulding County test and 7 years for that in Miami County have been practically the same—51 bushels per acre in Paulding County and 50¾ bushels in Miami County—but while every treatment has increased the yield in Miami County, there not only has been no definite increase from any treatment in Paulding County, either of fertilizers or manure, but acid phosphate, which is evidently a prime factor in producing increase in Miami County, seems actually to have diminished the yield in Paulding County.

Under similar treatment the yield of oats has averaged 52.46 bushels per acre for 6 years in Paulding County, and 47.20 bushels in Miami County, but while the yield has been increased by less than 4 bushels by the complete fertilizer in Paulding County, the same treatment has increased the yield by 10 bushels in Miami County.

Soybeans have given a 6-year average yield of 17.74 bushels per acre on unfertilized land in Paulding County, and of 20.95 bushels in Miami County. The different treatments have increased the yield by about a bushel per acre in Paulding County and by nearly 2 bushels in Miami County.

The wheat crop has been so completely winter-killed for 2 years in succession in Paulding County that the wheat has been abandoned and the land sown to oats, but in Miami County the yields of wheat for these two seasons have averaged about 12 bushels per acre on unfertilized land and 25 bushels where acid phosphate was used.

The clover has been cut twice each season since 1915 in Paulding County, but only once in Miami County. Comparing the average yields on the unfertilized land we get the following results for the 3 seasons, 1915, 1916 and 1917:

Paulding and Miami County Experiment Farms

Three-year average yields per acre of clover on unfertilized land

		Paulding	Miami
		Pounds	Pounds
Rotation I.	First cutting	3,326	3,599
	Both cuttings	6,247	.....
Rotation II.	First cutting	3,964	3,832
	Both cuttings	6,629	.....

It would seem from this comparison that there is but little difference in the adaptability of the two soils to clover, and it may be that the turning under of the second crop of clover on the Miami County farm has been a factor in maintaining the yields of the other crops.

The crops on the Paulding land have been large but the lack of response to treatment indicates that the best physical condition of the soil has not yet been attained.

The soil of this Paulding County Farm, and which represents the larger part of that county and portions of the adjoining counties—Defiance, Henry, Putnam and Van Wert—is unlike any other soil in Ohio. Originally deposited as a pond mud in the bottom of the shallow lake which occupied this region as an extension of Lake Erie in primeval time, darkened by the decay of the semiaquatic vegetation which occupied it as the lake receded, and only brought into cultivation within the last half-century, it is abundantly stocked with all the elements essential to the growth of crops, but both its flat topography and the impervious texture of its heavy clay soil—named Clyde clay in the soil survey of the State—have combined to make its drainage difficult, and its productiveness is measured by the effectiveness of its drainage.

Special studies of the drainage problem on this land have therefore been established, which must of course be carried over a number of seasons before definite results can be shown.

COMPARISON OF VARIETIES

DEPARTMENT OF AGRONOMY

CORN

The variety test of corn extends over 5 years, and includes 8 varieties. In the test of 1917 and 1914 Wheeler's Reid led. In 1916 and 1915, the Leaming. In 1913 Wheeler's Clarage. In the 5-year average, Wheeler's Reid is first, Cook's 75, second, Wheeler's Clarage, third, and Leaming, fourth.

TABLE 27.—Comparison of varieties of CORN. Paulding County Experiment Farm

Variety	Yield per acre					5-year average	
	1913	1914	1915	1916	1917	Grain	Stover
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb.*
Reid (Morisy)	40.97	49.22	73.58	38.23	72.38	54.88	4,117
Reid (Orcutt)	45.97	54.97	82.07	46.23	74.17	60.68	4,290
Reid (Wheeler)	47.36	67.53	77.25	47.01	76.84	63.20	4,216
Cook's 75	50.79	58.27	82.89	46 88	76.49	63.06	4,050
Ohio 84	48.54	48.22	75.00	45.02	71.67	57.69	3,592
Clarage (Wheeler)	51.50	61.72	73.35	47.55	75.24	61.87	3,692
Leaming	46.44	45.65	85.07	54.05	73.82	61.01	3,583
Darke County Mammoth	44.76	52.36	80.86	45.38	75.95	59.86	4,379
White Cap	.....	.....	.....	38.38	67.38	.....	.....

The test of number of plants per hill was continued in 1917 and 1916 as in 1915. The tests of 1915 and 1917 agree in showing a

gradual increase in yield from 2 to 4 plants per hill. In 1916 the planting was not done until June, which may possibly account for the different results that year.

TABLE 28.—Rates of planting CORN. Paulding County Experiment Farm

No. of stalks per hill	Yield per acre			Grain
	1915	1916	1917	
				Bu.
Two	64.29	27.10	62.14	51.18
Three	70.71	20.20	64.28	51.73
Four	77.14	22.90	65.71	55.25

OATS

Eight varieties of oats and one of spring barley have been tested, most of them for 6 years. The little White, a local variety, is first in yield; Ohio 6222, second, Big Four, third and Ohio 6203, fourth. In comparing the yields of oats and barley it should be remembered that a bushel of oats weighs 32 pounds and a bushel of barley 48 pounds.

TABLE 29.—Comparison of varieties of OATS, Paulding County Experiment Farm

Variety	Yield per acre						6-year average	
	1912	1913	1914	1915	1916	1917	Grain	Straw
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb.*
Big Four	67.77	46.30	48.29	81.62	39.08	67.46	58.42	2,417
Silver Mine	69.95	38.96	37.76	77.09	48.22	73.25	57.54	2,627
Swedish Select	69.27	26.77	42.76	78.65	47.29	60.68	54.24	2,684
Little White	69.03	44.11	57.14	79.28	51.35	83.10	64.00	2,818
Ohio 7009	59.33	.....	36.03	69.27	35.41	67.70	53.55	1,901
Ohio 6203	71.88	27.87	46.11	80.83	47.05	74.81	58.09	2,443
Ohio 6222	77.80	36.93	53.06	85.21	39.31	74.71	61.17	2,747
Wideawake	64.96	38.02	42.60	63.96	38.85	58.64	51.17	2,957
Oderbrucker barley	.....	.....	26.56	49.38	22.19	52.71	37.71	1,854

WHEAT

Four years' results are reported with 8 varieties of wheat. The crop of 1917 was greatly reduced by winter killing, while the crop of 1916 was entirely destroyed and the ground planted in oats. Averaging the 4 years' work the Trumbull is first in yield, Gladden, second, Nigger, third and Turkey Red, fourth.

TABLE 30.—Comparison of varieties of WHEAT, Paulding County Experiment Farm

Variety	Yield per acre					
	1913	1914	1915	1917	4-year average	
					Grain	Straw
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb.*
Nigger	49.24	35.91	40.98	11.83	34.49	3,722
Gladden	48.74	37.43	43.18	17.50	36.71	4,602
Mediterranean	40.31	29.62	28.47	15.17	28.39	3,281
Rudy	43.81	32.64	35.68	14.31	31.61	3,793
Turkey Red	45.01	35.81	42.99	13.87	34.42	4,115
Trumbull	47.11	39.29	43.85	17.08	36.83	4,262
Portage	54.84	38.44	32.12	9.12	33.63	3,819
Goens	39.04	33.58	26.55	15.66	28.71	4,620
Velvet Chaff	42.21	33.08	38.14	14.33	31.94	4,130

SOYBEANS

Two quite satisfactory crops of soybeans have been grown.

In 1916 the crop was almost ruined by a killing frost September 19. The Elton and Ohio 9100 made yields of 10 and 14 bushels, respectively. In 1917, 4 varieties, only, were grown and one was killed before maturing. Apparently only very early varieties can be depended upon to mature seed in this section year after year. In the 3-year average yield the Elton is first and Ohio 9100, second.

TABLE 31.—Comparison of varieties of SOYBEANS. Paulding County Experiment Farm

Variety	Color of beans	Yield per acre				
		1913	1914	1917	3-year average	
					Grain	Straw
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Lb.*
Mongol	Yellow	19.21	15.54	.....	.....	1,965
Ebony	Black	20.34	15.95	.....	.....	1,685
Elton	Yellow	28.49	21.51	17.14	22.38	2,163
Ohio 9100	Yellow	22.38	15.18	16.02	17.86	2,077
Ohio 9016	Yellow	16.77	18.24	.....	.....	2,330
Ohio 7496	Yellow	19.17	20.73	12.50	17.47	1,923
Ohio 9035	Brown	20.98	23.87	.....	.....	2,595
Medium Green	Green	13.67	13.79	13.70	13.72	1,823

BULLETIN

OF THE

Ohio Agricultural Experiment Station

NUMBER 323 MAY, 1918

COUNTY EXPERIMENT FARMS IN OHIO

PART III

THE CLERMONT COUNTY EXPERIMENT FARM

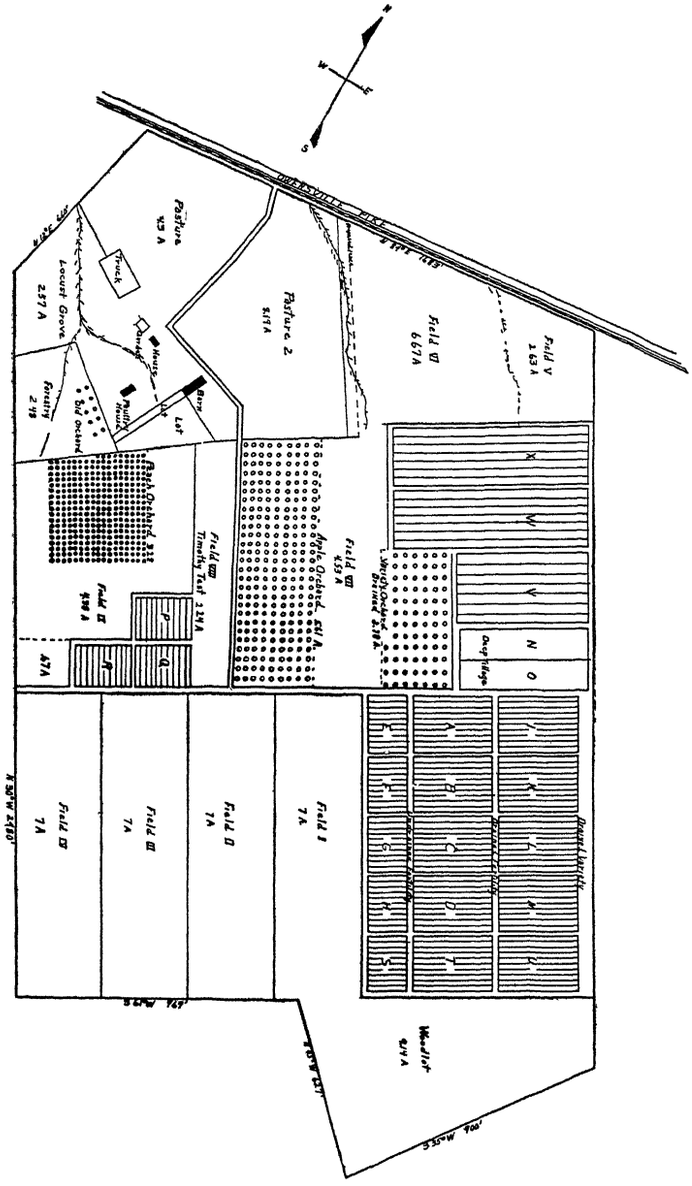
FIFTH AND SIXTH ANNUAL REPORTS, FOR 1916 AND 1917

C. W. MONTGOMERY, CHIEF

S. B. STOWE AND W. J. SMITH, SUPERINTENDENTS
HOWARD ELLIOTT, FOREMAN

PERSONNEL

Victor Herron resigned the superintendence of this farm February 1, 1916, and was succeeded June 1 by S. B. Stowe who resigned July 1, 1917, and was succeeded in September by W. J. Smith.



CLERMONT COUNTY EXPERIMENT FARM, Owensville, Ohio

LEGEND

Sections A. B. C. D. I. K. L. M. U. T. 1-10 acre plots (272 ft. 3 in. x 16 ft.) paths 3 ft.
Sections E. F. G. H. S. P. Q. R. 1-20 acre plots (136 ft. 1.5 in. x 16 ft.) paths 3 ft.
Sections N. O. deep tillage 1 acre each (437 ft. 3 in. x 99 ft. 7 in.) paths 3 1-4 ft.
Section V. .33 acre plots (450 x 32) 2 ft. paths
Sections W. X. 4-10 acre plots (690 x 26.66) 2 ft. paths

CLERMONT COUNTY STATISTICS

POPULATION (U. S. Census)

	1860	1870	1880	1890	1900	1910
Total	33,034	34,264	36,713	33,553	31,610	29,551
White	32,201	32,638	34,895	32,043	30,427	28,685
Negro	833	1,629	1,817	1,510	1,183	865
Foreign born	2,564	2,287	2,085	1,676	1,330	1,865
Rural	.....	.....	.....	.....	31,610	29,551
Urban	.....	.....	.....	.....	.....	.....

Population, 1910: Batavia, 1,034; New Richmond, 1,733; Bethel, 1,201; Loveland, 1,421.

FARMS (U. S. Census)

	1880	1890	1900	1910
Approximate land area....acres.	.....	.....	.....	297,600
Land in farms....acres.	281,885	269,025	274,880	274,210
Improved land in farms....acres.	229,533	227,606	233,432	228,064
Woodland in farms....acres.	44,229	} 41,419	41,448	{ 24,695
Other unimproved land in farms....acres.	8,123	}		{ 21,451
Total number of farms....number.	3,464	3,666	4,113	3,876
Area of average farm....acres.	81.4	73.4	66.8	70.7
Improved land per farm....acres.	66.3	62.1	56.5	58.8
Value of all property per farm....dollars.	3,747	3,042	2,355	3,814
Value of land and buildings per farm....dollars.	3,367	2,679	2,003	3,260
Value of land and buildings per acre....dollars.	41.36	36.50	30.00	46.11

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses	8,199	9,881	8,766	8,226	7,612	5,724
Cattle	14,854	14,006	12,315	13,146	10,301	9,747
Sheep	14,259	19,316	9,818	9,507	6,684	4,125
Hogs	43,856	33,608	28,448	20,460	14,730	11,540
Cattle equivalent total	28,864	29,179	24,907	24,369	20,054	17,037
Per 1,000 acres	.....	.....	109	107	86	75

FARM CROPS, 10-year average production (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn....acres.	35,598	35,563	40,823	35,772	35,377	36,781
Bushels.	1,184,476	1,035,232	1,223,709	951,727	903,854	912,721
Bushels per acre.	33.3	28.8	30.0	26.6	25.5	24.8
Oats....acres.	.....	13,563	13,344	13,369	8,057	9,836
Bushels.	.....	267,413	251,333	250,202	133,739	197,921
Bushels per acre.	.....	19.7	18.8	18.7	16.9	20.1
Wheat....acres.	22,607	21,488	16,048	18,630	21,751	12,874
Bushels.	265,744	190,233	163,196	165,917	214,738	142,559
Bushels per acre.	11.8	8.8	10.2	8.9	9.9	11.1
Rye....acres.	.....	1,086	1,131	941	1,551	2,339
Bushels.	.....	8,612	9,280	5,877	9,923	18,378
Bushels per acre.	.....	7.9	8.2	6.2	6.4	7.9
Meadows....acres	12,361	19,010	16,966	22,573	24,874	24,662
Tons.	11,535	18,048	14,379	18,915	20,391	18,770
Tons per acre.	.93	.95	.85	.84	.82	.76
Clover....acres.	.....	1,845	3,964	6,064	4,205	3,171
Tons.	.....	642	1,060	1,839	2,098	2,736
Tons per acre.	.....	.35	.27	.30	.50	.86
Potatoes....acres.	.....	4,108	5,634	3,758	1,819	1,130
Bushels.	.....	187,822	268,234	163,744	82,601	66,602
Bushels per acre.	.....	45.7	47.6	43.6	45.4	58.9
Orchards....acres.	.....	7,723	9,681	7,763	7,388	5,528
Apples....Bushels.	.....	75,272	230,209	205,063	114,085	37,193

FARM IMPROVEMENTS

Following is a summary of improvements made on this farm since its establishment in 1911.

	Year	Item	Cost	Amount	
Tile drainage:	1912-13	2,645 rds. 4-inch @	$0.54 per rd.	$1,428.30	
	1914	1,050 rds. 4-inch @	.54 per rd.	567.00	
		60 rds. 6-inch @	.78 per rd.	60 80	
	1915	129 rds. 4-inch @	.57⅓ per rd.	73.96	
		78¾ rds. main 6-8-10	1.45 per rd.	114.19	
	1916	360 rds. 4-inch @	.622 per rd.	224.08	
Total tile drains		4,322¾ rds. Ave. cost	.594 per rd.	T. cost	$2,468.17
Fencing:	1914	80 rds. wire @	$0.60 per rd.	$48.00	
	1915	59 rds. wire @	.64 per rd.	37.54	
	1916	67 rds. wire @	1.08 per rd.	72.84	
		40 rds. board @	2.04 per rd.	81.75	
Total fences		246 rds. Ave. cost	.975 per rd.	T. cost	$ 240.13
Buildings:	1911	Barn remodeled and enlarged (estimated cost).....		$1,100.00	
	1915	Poultry house.....		241.84	
					$1,341.84
Orchard plantings:	1912-13	390 apple trees @	$0.20 each	$78.00	
		145 apple trees @	.18 each	26.10	
					104.10
Entrance gate:	1915				54.34
Forestry plantings:	1914	1,000 forest trees @	$0.68 each	$68.00	
	1915	850 forest trees @	.62 each	52.70	
					120.70
				Total permanent improvements	$4,329.28

FINANCIAL SUMMARY

Inventory of Permanent Investment (costs) and Operating Equipment March 1, 1917

Land: 130.21 acres—original cost	$6,500.00	
Tile drainage: Cost to date	2,468.17	
Total land and drainage		$8,968.17
Permanent improvements:		
Fences	$ 240.13	
Buildings	1,341.84	
Orchards	104.10	
Entrance gate	54.34	
Forestry plantings	120.70	
Total improvements		$ 1,861.11
Total permanent investment		10,829.28
Operating equipment:		
Livestock: 4 horses $775; 108 chickens $180	$ 955.00	
Implements, tools and harness	1,221.15	
Feeds: hay $200; straw $3; corn $200	403.00	
Seeds: clover $34.61; timothy $5.50; alsike $5.40; red top $1.40; vetch $5; soybeans $170; corn $4.50	226.41	
Sundry supplies:		
Fertilizer $100; limestone $3; floats $1; tile $120; lumber $5; cement $6; posts $6; wire fence $24; paint $51.75; spray materials $8; binder twine $6; salt $0.35	331.10	
Total operating equipment		$ 2,936.66
Total investment		$13,645.24

FINANCIAL SUMMARY

Inventory of Permanent Investment Costs and Operating Equipment March 1, 1918

Land—original cost including buildings	$6,500.00	
*Permanent improvements to date	4,329.28	
Total permanent investment		$10,829.28
Operating equipment:		
Livestock—4 horses $825; 197 chickens $250	$1,075.00	
Machinery, tools and harness	1,307.00	
Crops, feeds, etc.—corn $150; oats $10; wheat $175; potatoes $20; hay $100; straw $20; bran $8.40; meat scrap $8; salt $1.35	492.75	
Seeds—clover $42; timothy $9; soybeans $315; miscellaneous $20	386.00	
Fertilizer and limestone	200.30	
Drain tile, 400 rods	120.00	
Building material—gravel $8; cement $39.75; lumber $50; concrete blocks $17.60; lead $12	127.35	
Containers	6.60	
Total operating equipment		3,720.00
Total investment		$14,549.28

*No improvements completed in 1917.

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1917

RECEIPTS

From county treasury		$1,892.69
From farm sales:		
Livestock—poultry	.72	
Livestock products—eggs	323.44	
Grain and beans—wheat $104.28; corn $1.50; soybeans $55	160.78	
Root crops—potatoes	18.50	
Unclassified sales	5.90	
		509.34
Total receipts		$2,402.03

EXPENDITURES

For labor			$1,020.23
For current expense—seeds $173.59; fertilizer, lime, etc. $205.96; spray materials $16; telephone and telegraph $20.50; transportation $16.68; postage $16.96; fuel and light $6; advertising $2.43; blacksmithing and repairs $51.20; containers $16.01; miscellaneous hardware $3.46			528.79
For machinery and tools			91.21
For permanent improvement:			
Buildings	$143.43		
Building material and construction—cement $22; gravel, etc. $2.35; lumber $220.36; painting $59.05	303.76		
		$447.19	
Drainage		92.75	
Fences		89.13	
Plot fixtures		10.11	
			639.18
For livestock:			
Purchases—poultry		18.00	
Maintenance—feeds $97; veterinary, medicine, etc. $5.50; straw $2.04		104.54	
			122.54
Total expenditures			$2,401.95
Balance in county treasury			.08
			$2,402.03

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1918

RECEIPTS

From county:		
Balance in treasury March 1, 1917	$ 0.08	
Maintenance fund distribution	2,004.10	
		$2,004.18
From farm sales:		
Livestock and products—horses $400; poultry $124.30; eggs $566.22	$1,080.52	
Crops—soybeans $144.01; wheat $19.80; hay $286.23	450.04	
Containers—1 bag	.40	
		1,530.96
Total receipts		$3,535.14

EXPENDITURES

For labor		$1,257.42
For current expenses—feed $176.99; seeds $107.10; lime and fertilizer $165.10; spray material $8.33; threshing $14; building repair $14.85; water system maintenance $14.07; horse shoeing, etc. $19.50; engine supplies $18.60; implement repairs and renewals $39.87; bags and twine $0.72; miscellaneous hardware $5.49; office supplies $10.50; communication $26.10		621.22
For permanent improvements:		
Drain tile	$ 4.13	
Fence	7.45	
Building material and construction	291.05	
Concrete materials	51.60	
Permanent planting:		
Forestry	$7.70	
Ornamental	3.66	
	11.36	
		365.59
For machinery, tools and harness		103.47
For livestock—horses $370.15; poultry $230		600.15
Total expenditures		$2,947.85
Balance in county treasury February 28, 1918		570.33
In hands of superintendent for payment of small bills		16.96
		$3,535.14

CROP AND LABOR STATISTICS OF THE CLERMONT COUNTY EXPERIMENT FARM FOR 1916

Area of farm, 130.21 acres
Area cultivated, 84.62 acres
Permanent pasture, 12.49 acres
Woodland, 13.19 acres
Waste, 5.07 acres
Public roads, .77 acre
Farm roads and paths, 10.68 acres
Miscellaneous, 3.39 acres

Crop	Number of plots	Total area	Total yield	Yield per acre
PLOT WORK		*Acres*		
Corn	39	5.81	12,504 lb.	30.74 bu.
Oats	10	1.00	640 lb.	20.00 bu.
Cowpeas	1	.10	2 lb.	.33 bu.
Soybeans	29	2.40	1,191 lb.	8.27 bu.
Wheat	54	.40	2,557 lb.	9.68 bu.
Hay (timothy and clover)	30	2.00	6,145 lb.	1.54 ton
Hay (soybean)	2	1.00	2,405 lb.	1.20 ton
Potatoes	10	.50	1,481 lb.	49.66 bu.
Alfalfa	10	1.00	none harvested	
	185	18.21		
Area not producing any crop in 1916, Block X.		2.80		
Total plot acres		21.01		
FIELD WORK				
Corn		7.00	179.43 bu.	25.63 bu.
Soybeans		11.09	2,244 lb.	3.37 bu.
Wheat		6.10	4,700 lb.	12.84 bu.
Hay (timothy and clover)		15.37	35,995 lb.	1.16 ton
Hay (soybean)		1.50	2,920 lb.	.97 ton
Hay (oats and peas)		1.00	1,550 lb.	.77 ton
Peaches		3.28	185 lb.	
Crop acres unharvested				
Soybeans disked in:				
In peach orchard		3.28		
In Field IV		7.00		
Total crop acres		76.63		
Less area counted twice:				
Soybeans followed				
Oats and peas	1A			
Rate seeding wheat	.5			
Soybeans in orchard	3.28	4.78		
		71.85		
Cultivated area unharvested:				
Apples (sod mulch)		2.80		
Young grass		9.30		
Catch crops		.67		
Total cultivated acres		84.62		
Less plot acres		21.01		
Total field acres		63.61		

	Corn	Oats	Soybean	Wheat	Hay (*Lb.*) Mixed	Hay (*Lb.*) Soy	Potatoes
	Bu.	*Bu.*	*Bu.*	*Bu.*			*Bu.*
Lowest yielding plots per acre	13.28	15.94	3.17	1.33	950	1,970	44.65
Highest yielding plots per acre	54.	22.81	14.	19.67	7,000	2,840	59.33

Number work horses used on Clermont County Experiment Farm in 1916 4
Number crop acres per work horse 17.96
Number man hours per year (March 1, 1916 to February 28, 1917 inclusive) 5,965
Number hosre hours per year (March 1, 1916 to February 28, 1917 inclusive) 4,261.5

CROP AND LABOR STATISTICS OF THE CLERMONT COUNTY EXPERIMENT FARM FOR 1917

Area in farm, 130.21 acres
Area in farmstead, 4 acres
Area cultivated, 86.19 acres
Permanent pasture, 12.49 acres
Woodland, 13.19 acres
Waste, 2.89 acres
Public roads, .77 acre
Farm roads and paths, 10.86 acres

Crop	Number of plots	Total area	Total yield	Yield per acre
PLOT WORK		*Acres*	*Pounds*	
Corn	39	6.30	16,551	37.21 bu.
Oats	9	.90	1,162	43.47 bu.
Barley	1	.10	67	13.90 bu.
Cowpeas	1	10	9	1.50 bu.
Soybeans	36	4.71	2,914	8.50 bu.
Wheat	61	6.00	4,461	12.94 bu.
Hay (timothy and clover)	30	2.00	3,246	.81 ton
Hay (soybeans)	2	1.00	2 005	1.00 ton
Potatoes	10	.50	1,992	66.40 bu.
Alfalfa	10	1.00	2,160	1.80 ton
Forage	11	1.10	not harvested	
Total	210	23.71		
FIELD WORK				
Corn		7.00	8.840	18.04 bu.
Soybeans		10.01	2,054	3.41 bu.
Wheat		9.60	7,114	12.35 bu.
Hay (timothy and clover)		18.54	48,765	1.31 ton
Clover (seed)		9.00	90	10.00 lbs.
Orchard		11.67	no crop	
Crop acres unharvested				
Soybeans disked in:				
In peach orchard		3.28		
In field 3		7.00		
Grass clipped Field 9 and Blocks S and T		7.05		
Total crop acres		83.05		
Less area counted twice		20.67		
Total field acres		62.48		
Total plot acres		23.71		
Total cultivated acres		86.19		

	Corn	Oats	Soybeans	Wheat	Hay (*Lb.*) Mixed	Hay (*Lb.*) Soy	Potatoes
		Bu.	*Bu.*	*Bu.*			*Bu.*
Lowest yielding plots per acre	10.73	20.94	1.	.66	1,200	2,170	35.
Highest yielding plots per acre	66.86	42.18	12.55	29.53	4,000	2,100	111.

Number work horses used on Clermont County Experiment Farm in 1917....4
Number crop acres per work horse....20.76
Number man hours per year (March 1, 1917 to February 28, 1918 inclusive)....6,448.
Number horse hours per year (March 1, 1917 to February 28, 1918 inclusive)....4,040.

THE AGRICULTURAL CONDITIONS OF CLERMONT COUNTY

S. B. STOWE

This brief agricultural survey of Clermont County is intended to bring out a few points relative to the farming conditions of the county and correlate them with the work which is in progress at the county experiment farm.

The census of 1910 shows that there were 3,876 farms in Clermont County, with an average area of 70.7 acres, making a total of 274,000 acres that were used for agricultural purposes. The improved area for each farm is given as 58.8 acres. About 26 acres were in cereal crops, showing that about 100,000 acres of Clermont County land is used for the production of cereals and hay crops. About the same amount is used for pasture land, the remainder being classed as unimproved. The average value of land and buildings per acre for 1910 was $46.11; in 1900 it was $30. There was a decrease of 6½ percent in the population of Clermont County during the period from 1900 to 1910. The percentage of decrease would be even greater in the county if the incorporated towns were excluded from the count. The owners live upon and manage 2,797 of the farms and 1,042 are given over to tenantry.

FARM CROPS

The leading crop of the county, both in acreage and total bushels produced, is corn. This crop has occupied an average area of about 36,000 acres since 1850, but the yield per acre has steadily fallen from 33 bushels during the fifties to less than 25 bushels for the 10 years, 1900-1910. There are, however, some splendid valley lands on which good yields of corn are produced.

The area planted to wheat has fallen from 22,000 acres during the fifties to 12,000 acres or less. The average yield is about 11 bushels per acre. We have noted a considerable number of fields that have failed entirely to produce either corn or wheat.

The area planted to oats was about 13,000 acres until 1890. Since then it has been reduced to about half that area. The average yield is about 20 bushels per acre. The complaint is quite general that it is impossible to raise a profitable crop of oats. It is the opinion of many that they succeed in getting a better stand of clover after oats than upon wheat ground. This is explained by the character of the soil, which has a decided tendency to puddle and not to honeycomb suitably for clover seeding.

Rye as a field crop is gaining in favor. The usual area is about 4,000 acres and the yield near 10 bushels per acre. The outstand-

ing fact of these figures is that the total acreage planted to the small cereals is usually less than half that planted to corn, bearing out the general impression that there is a lack of systematic rotation.

The hay crops have increased in area from about 15,000 acres during the fifties to 28,000 acres since 1900. The average yield is about three quarters of a ton per acre. The area producing clover is around 3,000 acres. The opinion prevails that it is impossible to grow clover successfully. The soybean crop is coming into favor rapidly both as a grain and a forage crop. The cultivation of this crop is as yet in the experimental stage.

The tobacco crop attains considerable importance, about 2,000 acres being planted each year. We must commend the thoroughness of Clermont County farmers in preparing and growing this crop. It certainly affords a splendid demonstration that this land is capable of producing good crops when carefully cared for and fertilized.

About 3,000 acres are devoted to apple and peach orchards. There are a considerable number of careful fruit growers in the county who are quite successful and who believe that this land is capable of producing an apple of good color and quality.

The tomato canning industry is being developed but the price has not been sufficient to encourage a large extension. The quality of the Clermont tomato is good and perhaps superior to that grown in some other sections.

Vegetable gardening is followed to a considerable extent in the southwestern part of the county. Cincinnati affords a splendid outlet for the produce raised.

LIVESTOCK

The number of mature horses has fallen from nearly 10,000 during the sixties to fewer than 6,000 since 1900, indicating that few farmers have more than a single team of horses.

There are on the average about 10,000 dairy cows in the county. The dairy products are sold in the form of whole milk and cream. The dairy industry is largely a development of the last twelve years. It is in the initial stages as yet, but there seems to be an appreciation among the farmers of the county of the fact that dairy farming makes a good basis for land improvement.

Sheep are kept in limited numbers, the general impression being that the dog menace makes sheep growing a hazardous undertaking.

The number of hogs kept in the county has fallen from nearly 44,000 during the fifties to fewer than 12,000 since 1900—scarcely enough to provide the meat necessary for home use.

FARM INCOME

The average annual value per acre of the cereals produced is a little less than $9, from which we may conclude that the average gross income per farm is not far from $600. The bankers of the county state that the farmers are not large depositors. We are inclined to think that a liberal extension of credit to many men who wish to improve their land would be a good investment for the future business of the county.

DRAINAGE

Many thousands of acres of land are left without any underdrainage, the prevailing opinion being that tile drainage is not a success upon this type of soil. The damage done by excess of water nearly every year is tremendous and would certainly justify a more thorough test of underdrainage. The work of the Experiment Farm is indicating that one of the chief results of drainage may be to greatly increase the effect of fertilizers and manures. Unfertilized land has shown an increase of only two or three bushels of corn to the acre for tiling, while land dressed with 8 tons per acre of manure reinforced with acid phosphate, 40 pounds to the ton of manure, has produced a 4-year average of 35 bushels on undrained land as against 50 bushels on drained land.

FARM MANURE

We may refer more particularly to the value of farm manure as shown in the foregoing results. Up to the present time we have found fewer than a dozen manure pits in the county, leaving over 3,600 back barnyards which are responsible for the wastage of nearly $75,000 worth of fertilizing elements if they were bought upon the market. This computation is based upon the confinement of the animals for a period of six months and an estimate, which we believe is conservative, that one-third of the total fertilizing value of the manure is lost. In other words, the wastage from Clermont County's barnlots would buy and equip 5 experiment farms every year.

THE NITROGEN PROBLEM

The nitrogen problem is no less acute than that of saving the farm manure. When we recall that usually there is only about one

thousand acres of clover in the county and remember that the roots of an acre of clover which will yield one ton of hay will add 20 pounds of nitrogen to that acre, we certainly feel that legume crops should be given much greater prominence in the rotations practiced upon this land. We estimate that at least $100,000 worth of nitrogen could be added to this soil each year if men would only set about systematically to grow some legume upon only one-third of the cereal acres. Both soybeans and clover are being grown successfully upon the Experiment Farm and we urge that the results be observed.

CLOVER

On the Experiment Farm clover seed is sown broadcast upon a portion of the wheat in the spring. The plan in 1916 was to make two sowings, dividing the amount per acre into two equal parts. Alongside this there is a strip of wheat which was harrowed during the month of April and followed by the seed sower. The clover sown upon the front field during April of 1916 promises a good yield for 1917. It was drilled directly upon the disked ground without any nurse crop. It is worth while to make a determined effort to grow clover in Clermont County.

SOYBEANS

Soybeans have been grown with considerable success upon the Experiment Farm. We call attention to the variety tests that are being made both for forage and seed. The soybean is being used regularly in three different rotations. It has not been difficult to secure inoculation. The soybeans that have been sown broadcast, allowed to grow and then disked into the soil have made the basis of beginning soil improvement on land that was exceedingly poor. The soybean has also proven to be a good cover crop in the apple orchard.

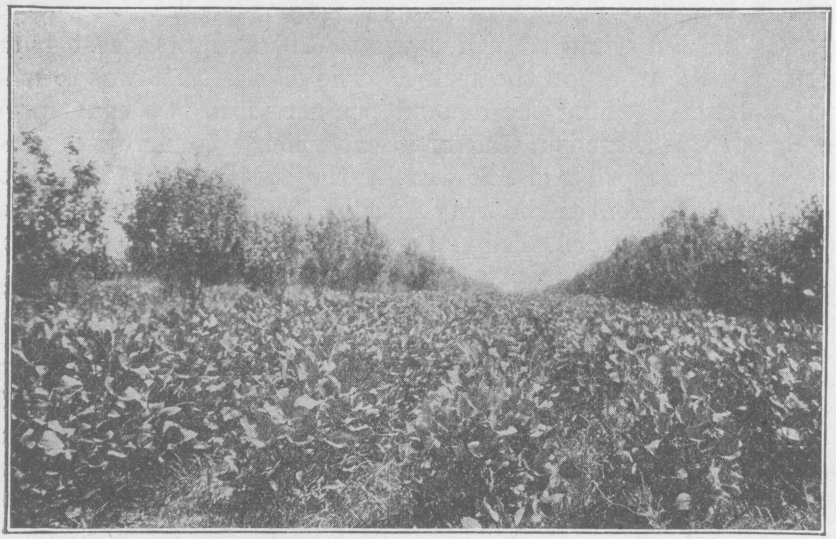
LIME

The litmus test of several hundred samples of Clermont County soil has indicated a lack of lime. While there has been some increased yield on the Experiment Farm due to the application of lime it has been shown that it is necessary to do several other things first. We have found a number of men in the county who have had the same experience, who say that they have been unable to get increased crops from the use of lime on land that is wet and deficient in the other elements of soil fertility. **Neither lime nor fertilizer nor manure can produce its full effect on undrained land.**

ROTATIONS

Recalling that nearly one-half the cultivated area of Clermont County is put into corn each year, which certainly indicates an unbalanced rotation—an indication confirmed by the steady decrease in yield for 60 years—we wish to refer to some of the constructive rotations that are being practiced upon the Experiment Farm, for example, the

Four-year rotation of corn, soybeans, wheat and clover,
Three-year rotation of corn, soybeans and wheat,
Two-year rotation of corn and soybeans.



Soybeans in orchard, Clermont County Experiment Farm

We also may mention the potato, wheat and clover rotation and the variety rotation of corn, oats, soybeans and wheat.

As these rotations are followed the relative importance of farm manure and complete fertilizer for soil improvement will be demonstrated. As a whole this rotation work is worthy of careful study by men who are interested in soil improvement.

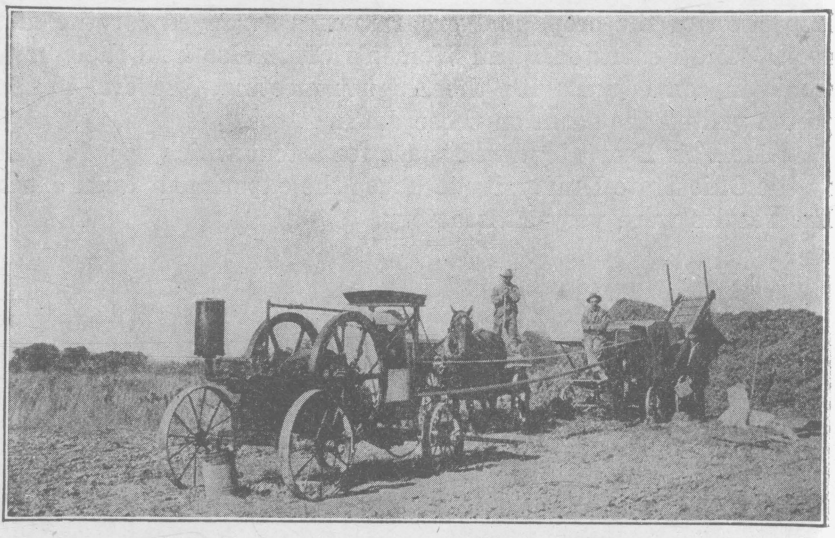
GRASS LAND

The fact that nearly 100,000 acres of Clermont County land is devoted to growing grass shows that the methods of pasture improvement should be studied. The custom of turning the stock upon the pasture very early in the season often results in much

injury, the trampling and puddling of the clay soil while wet often more than offsetting the value of the pasturage.

THE ORCHARD WORK

In the apple orchard the results of various methods of pruning are being demonstrated; also a comparison between the sod mulch method and cultivation with cover crops of soybeans and rye. The effect of applications of acid phosphate upon a sod mulch orchard will be demonstrated.



Threshing soybeans, Clermont County Experiment Farm

POULTRY

The poultry operations have been profitable. Leghorn hens are used for egg production alone. A standard method of feeding has been used. Nearly 2,077 dozens of eggs were gathered during the year ending October 1, 1916. The gross return per hen during the first year was $2.17, the net return 62 cents. The results of the second year laying period of the same group of hens will be reported in the future.

FARM MANAGEMENT

A total of 360 rods of tile was laid in 1916. The ditch was dug and the tile laid at a cost of 23 cents per rod. A breaking plow was used to fill the ditch. The original cost of the tile was about 25

cents per rod, making a total cost of near 50 cents per rod. The land tiled is the blocks that have been chosen for the three-year rotation of corn, soybeans and wheat.

A new manure shed, wagon shed and corn crib combined has been nearly finished during the year. A careful account has been kept of the cost of this building and will be given when the building is completed.

MEETINGS AND VISITORS

Two field meetings—one in June and the other in August, 1916—were held at the Farm. The forenoon was given over to inspection of the crops and program was arranged for the afternoon. The Federated Farm Women's Clubs also held their annual picnic in connection with the August meeting. Several hundred people visited the farm on these dates.

The Fair Board tendered space for a tent which was furnished by the Ohio State University to house the experiment farm exhibit. The results were very satisfactory.

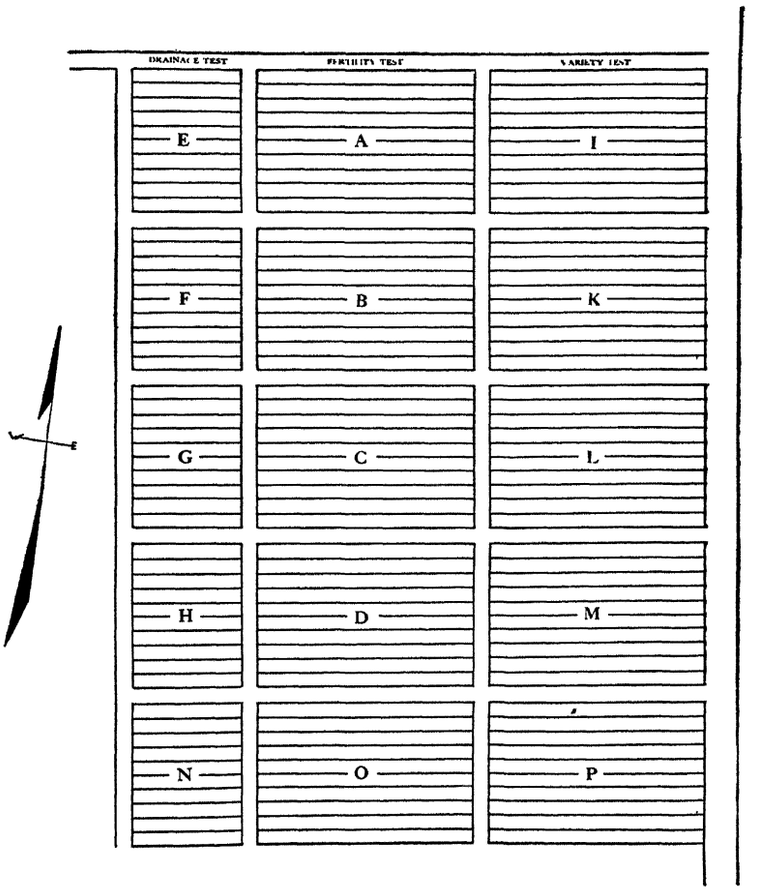
Effect of fertilizers on wheat, Clermont County Experiment Farm

EXPERIMENTS IN THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Four experiments with fertilizers and manure on crops grown in rotation are in progress on this farm; namely;

Rotation I: Corn, soybeans, wheat, clover, on drained land.
Rotation I: Corn, soybeans, wheat, clover, on undrained land.
Rotation II: Corn, soybeans, with cover crops between.
Rotation III: Potatoes, wheat, clover.



Arrangements of plots, Clermont County Experiment Farm

Blocks A, B, C, D. Fertility tests on drained land
Blocks E, F, G, H. Fertility tests on undrained land
Blocks I, K, L, M. Variety tests (drained land)
Blocks N, O, P, additional tests
The plots in each block are numbered from 1 to 10, beginning at the north side

The plan of fertilizing in these rotations is given in Table 32, the treatment of Rotation I, drained and undrained land, being the same except for the drainage and the same as that of Rotation II on the Miami and Paulding County Experiment Farms. The arrangement of plots in these rotations is shown in the diagram. The results for 1916 and 1917, and the average outcome for the entire period of the experiments are given in Tables 33 to 40.

TABLE 32.—Plan of fertilizing, Clermont County Experiment Farm

Pounds of fertilizing materials per acre for each crop

Plot	Acid phosphate	Muriate potash	Nitrate soda	Powdered limestone	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
	Rotation I: Corn-soybeans-wheat-clover									
	On corn				On soybeans			On wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	200	50	50	4,000	100	20	30	200	20	80
7										
8	Manure, 8 tons, phosphated							200	50	50
9	Manure, 8 tons, phosphated			4,000				200	50	50
10										
	Rotation II: Potatoes-wheat-clover									
	On potatoes				On wheat					
1										
2	200				200					
3	200	50			200	50				
4										
5	200	50	50		200	50	50			
6	400	100	100		400	100	100			
7										
8	Untreated manure, 8 tons									
9	Untreated manure, 8 tons; Acid phosphate, 200 lb.									
10										

TABLE 33.—Fertilizers, manure and lime on CORN, Clermont County Experiment Farm. Drained and undrained land
Yield and increase per acre

Plot	Treatment per acre	1916 Yield Grain	1916 Yield Stover	1916 Increase Grain	1916 Increase Stover	1917 Yield Grain	1917 Yield Stover	1917 Increase Grain	1917 Increase Stover	Average Yield Grain	Average Yield Stover	Average Increase Grain	Average Increase Stover	Plot
Rotation I: Corn-soybeans-wheat-clover. Drained land		Block D				Block A				6-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	13.43	1,300	.....	.....	43.57	2,250	.....	.....	23.26	1,442	.....	.....	1
2	Acid phosphate, 200 lb	15.71	1,200	1.42	—117	37.14	2,450	—2.14	117	25.83	1,523	3.43	84	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	32.14	1,500	17.00	167	50.00	3,000	15.00	583	31.97	1,783	10.43	346	3
4	None	16.00	1,350	.....	.....	30.71	2,500	.....	.....	20.69	1,435	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	34.29	1,900	19.19	583	63.57	2,950	30.24	567	37.43	1,833	16.51	423	5
6	Acid phos. 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; powdered limestone, 2 tons	36.71	1,800	22.52	517	65.00	3,250	29.05	983	38.64	1,897	17.49	512	6
7	None	13.29	1,250	.....	.....	38.57	2,150	.....	.....	21.38	1,360	.....	.....	7
8	Phosphated manure, 8 tons	43.71	2,150	29.75	900	58.57	2,800	28.43	933	43.31	2,082	23.82	761	8
9	Phosphated manure, 8 tons; powdered limestone, 2 tons	54.00	2,850	39.38	1,600	55.71	3,250	33.99	1,667	44.59	2,458	27.00	1,177	9
10	None	15.29	1,250	.....	.....	13.29	1,300	.....	.....	15.69	1,242	.....	.....	10
	Average unfertilized yield	14.50	1,287	.....	.....	31.53	2,050	.....	.....	20.25	1 369	.....	.....	
Rotation II: Corn-soybeans-wheat-clover. Undrained land		Block H				Block E				4-year average				
1	None	20.29	900	.....	.....	29.21	1,900	.....	.....	25.96	1,587	.....	.....	1
2	Acid phosphate, 200 lb	26.29	1,300	4.86	300	33.71	1,700	1.24	—433	27.25	1,412	0.96	— 221	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	25.14	1,300	2.57	200	56.00	2,800	20.76	433	31.82	1,725	5.21	46	3
4	None	23.71	1,200	.....	.....	38.00	2,600	.....	.....	26.93	1,725	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	28.57	1,300	5.72	200	63.14	2,800	23.43	333	33.21	1,687	6.36	8	5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb; powdered limestone, 2 tons	34.57	1,400	12.57	400	66.86	2,100	25.43	—233	38.68	1,625	11.89	—8	6
7	None	21.14	900	.....	.....	43.14	2,200	.....	.....	26.71	1,587	.....	.....	7
8	Phosphated manure, 8 tons	24.00	1,000	5.24	33	58.29	3,000	14.10	1,067	34.11	1,700	8.92	242	8
9	Phosphated manure, 8 tons; powdered limestone, 2 tons	31.43	1,200	15.05	167	54.00	2,100	8.76	433	34.82	1,562	11.15	233	9
10	None	14.00	1,100	.....	.....	46.29	1,400	.....	.....	22.14	1,200	.....	.....	10
	Average unfertilized yield	19.78	1,025	.....	.....	39.29	2,025	.....	.....	25.44	1,525	.....	.....	

TABLE 34.—Fertilizers and manure on SOYBEANS, Clermont County Experiment Farm. Drained and undrained land
Yield and increase per acre

Plot	Treatment per acre	1916				1917				Average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Beans	Straw	Beans	Straw	Beans	Straw	Beans	Straw	Beans	Straw	Beans	Straw	
	Rotation I: Corn-soybeans-wheat-clover. Drained land	Block C				Block D				4-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	9.00	710	.....	.....	8.00	1,570	.....	.....	6.62	1,247	.....	.....	1
2	Acid phosphate, 100 lb.	11.17	1,930	2.23	600	10.50	1,920	1.83	340	8.50	1,640	1.43	353	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	12.33	2,110	3.44	810	12.00	2,180	2.67	590	9.75	1,727	2.24	402	3
4	None	8.83	1,270	.....	.....	10.00	1,600	.....	.....	7.96	1,365	.....	.....	4
5	Acid phos., 100 lb.; mur. pot., 20 lb.; nitrate soda, 30 lb.	11.67	1,800	3.28	453	14.17	2,450	4.39	887	10.46	1,867	2 65	480	5
6	Acid phos., 100 lb.; mur. pot., 20 lb., nitrate soda, 30 lb.*	14.00	2,010	6.06	587	16.50	2,710	6.95	1,183	11.75	2,105	4.10	695	6
7	None	7.50	1,500	.....	.....	9.33	1,490	.....	.....	7.50	1,432	.....	.....	7
8	Phosphated manure on corn	12.33	2,260	5.11	860	14.67	2,770	5.06	1,197	11.21	2,235	3.85	797	8
9	Phosphated manure and powdered limestone on corn	11.50	2,860	4.55	1,560	21.67	3,450	11.78	1,793	12.83	2,422	5.61	978	9
10	None	6.67	1,200	.....	.....	10.17	1,740	.....	.....	7.08	1,450	.....	.....	10
	Average unfertilized yield	8.00	1,350	.....	.....	9.37	1,600	.....	.....	7.29	1.379	.....	.....	
	Rotation I: Corn-soybeans-wheat-clover. Undrained land	Block G				Block H				3-year average				
1	None	6.33	1,720	.....	.....	14.23	3,140	.....	.....	9.00	2,227	.....	.....	1
2	Acid phosphate, 100 lb	6.33	1,820	.11	193	15.33	3,580	1.22	360	9.55	2,327	—.15	42	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	5.67	1,660	—.44	127	15.00	3,600	1.11	300	10.56	2,467	—.15	125	3
4	None	6.00	1,440	.....	.....	13.67	3,380	.....	.....	11.11	2,400	.....	.....	4
5	Acid phos., 100 lb.; mur. pot., 20 lb.; nitrate soda, 30 lb.	6.67	1,600	—.33	53	15.67	3,460	2.00	347	13.22	2,407	1.70	138	5
6	Acid phos., 100 lb.; mur. pot., 20 lb., nitrate soda, 30 lb.*	10.00	2,300	2.00	647	19.67	3,920	6.00	1,073	15 56	2,753	3.63	616	6
7	None	9.00	1,760	.....	.....	13.67	2,580	.....	.....	12.33	2,007	.....	.....	7
8	Phosphated manure on corn	9.67	2,320	.45	573	14.00	3,560	1.55	1,240	14.00	2,793	2.33	851	8
9	Phosphated manure and powdered limestone on corn	13.67	2,980	4.22	1,247	19.67	4,220	8.45	2,160	17.56	3,280	6.56	1,402	9
10	None	9.67	1,720	.....	.....	10.00	1,800	.....	.....	10.33	1,813	.....	.....	10
	Average unfertilized yield	7.75	1,660	.....	.....	12.92	2,725	.....	.....	10.70	2,112	.....	.....	

*Powdered limestone on corn.

TABLE 35.—Fertilizers and manure on WHEAT, Clermont County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916				1917				Average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Rotation I: Corn-soybeans-wheat-clover. Drained land	Block B				Block C				5-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	3.67	780	.....	.....	.67	110	.....	.....	6.34	786	.....	.....	1
2	Acid phosphate, 200 lb	8.00	820	5.11	227	7.83	430	6.88	270	10.63	1,084	4.46	291	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	8.17	1,010	6.05	603	10.33	680	9.11	470	11.93	1,184	5.93	385	3
4	None	1.33	220	.....	.....	1.50	260	.....	.....	5.83	806	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	12.33	760	10.78	470	16.17	1,180	14.11	870	16.47	1,748	10.44	961	5
6	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.;	14.67	1,120	12.89	760	15.83	1,150	13.22	790	17.63	1,744	11.42	977	6
7	None	2.00	430	.....	.....	3.17	410	.....	.....	6.40	748	.....	.....	7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	16.67	1,200	13.67	813	18.33	1,670	15.55	1,337	16.67	1,726	10.73	1,048	8
9	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.*	18.33	1,600	14.33	1,257	20.33	1,830	17.94	1,573	19.23	1,986	13.76	1,378	9
10	None	5.00	300	.....	.....	2.00	180	.....	.....	5.00	538	.....	.....	10
	Average unfertilized yield	3.00	432	.....	.....	1.83	240	.....	.....	5.89	719	.....	.....	
	Rotation I: Corn-soybeans-wheat-clover. Undrained land	Block F				Block G				3-year average				
1	None	3.00	200	.....	.....	1.33	520	.....	.....	3.33	567	.....	.....	1
2	Acid phosphate, 200 lb	4.33	240	.44	—260	6.33	420	5.11	13	11.11	887	6.96	198	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	8.33	1,000	3.55	220	5.00	500	3.89	207	12.78	1,680	7.81	869	3
4	None	5.67	1,060	.....	.....	1.00	180	.....	.....	5 78	933	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 50 lb.	14.00	1,460	8.11	480	9.00	720	7.33	460	15.44	1,227	9.48	276	5
6	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 50 lb.*	15.33	1,980	9.22	1,080	12.67	840	10.34	500	17.00	2,113	10.85	1,144	6
7	None	6.33	820	.....	.....	3.00	420	.....	.....	6.33	987	.....	.....	7
8	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	19.00	2,160	12.22	1,400	12.67	1,240	9.89	873	16.11	2,000	8.93	871	8
9	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.*	19.67	2,120	12.45	1,420	15.33	1,480	12.78	1,167	17.89	2,100	9.85	829	9
10	None	7.67	640	.....	.....	2.33	260	.....	.....	8.89	1,413	.....	.....	10
	Average unfertilized yield	5.67	685	.....	.....	1.91	345	.....	.....	6.08	975	.....	.....	

*Powdered limestone on corn.

TABLE 36.—Residual effect on CLOVER of treatment of previous crops, Clermont County Experiment Farm

Plot	Total fertilizers, manure and limestone on previous crops of rotation	Drained land						Undrained land					
		1916		1917		4-year average		1916		1917		2-year average	
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase
	Rotation II: Corn-soybeans-wheat-clover	Block A		Block B		4-year average		Block E		Block F		2-year average	
		Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*
1	None	1,768	.....	716	.....	1,681	.....	1,768	.....	1,015	.....	1,391	.....
2	Acid phosphate, 500 lb	1,642	84	968	336	2,016	618	2,274	169	1,179	—59	1,726	55
3	Acid phosphate, 500 lb,; muriate potash, 90 lb	1,726	379	758	211	1,930	398	2,442	0	1,432	—29	1,937	—14
4	None	1,137	.....	463	.....	1,458	.....	2,779	.....	1,684	.....	2,231	.....
5	Acid phos., 500 lb.; mur. potash, 90 lb.; nitrate soda, 160 lb.	2,063	673	1.137	618	2,329	783	3,200	505	2,274	562	2,737	533
6	Acid phos., 500 lb.; mur. potash, 90 lb.; nitrate soda, 160 lb.; powdered limestone, 2 tons	3.495	1,853	1,895	1,319	2,864	1,229	2,695	85	1,516	—224	2,105	—69
7	None	1,895	.....	632	.....	1,724	.....	2,526	.....	1,768	.....	2,147	.....
8	Phosphated manure, 8 tons; acid phosphate, 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	2,274	744	1,389	687	2,973	1,243	1,768	—674	2,442	758	2,105	42
9	Phosphated manure, 8 tons; powdered limestone, 2 tons; acid phos., 200 lb.; muriate posash, 50 lb.; nitrate soda, 50 lb	3,200	2,035	2,021	1,249	3,498	1,761	2,274	— 84	3,368	1,768	2,821	842
10	None	800	.....	842	.....	1,743	.....	2,274	.....	1,516	.....	1,895	.....
	Average unfertilized yield	1,400	.....	663	.....	1,651	.....	2,337	.....	1,499	.....	1,918	.....
	Rotation III: Potatoes-wheat-clover	Block P		Block Q		2-year average							
1	None	978	.....	1,516	.....	1,247	.....						
2	Acid phosphate, 400 lb	2,178	933	2,947	1,319	2,562	1,126						
3	Acid phosphate, 400 lb.; muriate potash, 200 lb	2,667	1,156	2,947	1,206	2,807	1,181						
4	None	1,778	.....	1,853	.....	1,815	.....						
5	Acid phos., 400 lb.; mur. potash, 200 lb.; nitrate soda, 200 lb.	2,178	474	2,947	1,066	2,562	770						
6	Acid phos., 800 lb.; mur. potash, 400 lb.; nitrate soda, 400 lb.	2,444	815	2,274	365	2,359	590						
7	None	1,555	.....	1,937	.....	1,746	.....						
8	Untreated manure, 8 tons	2,978	1,615	3,453	1,488	3,215	1,551						
9	Untreated manure, 8 tons; acid phosphate, 200 lb	3,111	1,941	3,358	1,375	3,239	1,658						
10	None	978	.....	2,021	.....	1,499	.....						
	Average unfertilized yield	1,322	.....	1.836	.....	1,579	.....						

FERTILIZERS, LIME AND MANURE ON DRAINED AND UNDRAINED LAND

This experiment was begun in 1912 on the land intended for the drained part, which was drained that season and the next, and the comparison between the drained and undrained land was begun in 1914 by planting corn and soybeans on the undrained land. The bean crop was a failure, however, so that the crops thus far harvested on this land have been 4 of corn, 3 each of soybeans and

TABLE 37.—Fertilizers, lime and manure on drained and undrained land, Clermont County Experiment Farm

Plot	Corn—4 years		Soybeans—3 years		Wheat—3 years		Clover hay 2 years
	Grain	Stover	Grain	Straw	Grain	Straw	
	Yield per acre—Drained land						
	Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Lb.*
1	24.60	1,637	7.44	1,213	7.50	983	1,242
2	28.32	1,712	9.67	1,653	11.05	1,253	1,305
3	36.21	2,025	11.11	1,817	12.56	1,347	1,242
4	21.28	1,607	9.11	1,343	5.94	927	800
5	41.32	2,030	15.56	1,960	17 56	1,813	1,600
6	42.60	2,137	13.83	2,217	19.61	1,823	2,695
7	23 28	1,562	8.61	1,460	6.11	800	1,263
8	50.18	2,400	13.17	2,420	19.17	1,873	1,831
9	50.53	2,937	15.22	2,610	22.78	2,283	2,610
10	16.47	1,437	8.11	1,447	4.56	443	821
	21.41	1,561	8.65	1,372	6.03	788	1,031
	Yield per acre—Undrained land						
1	25.96	1,587	9.00	2,227	3.33	567	1,391
2	27.25	1,412	9.55	2,327	11.11	887	1,726
3	31.82	1,725	10.56	2,467	12.78	1,680	1,937
4	26.93	1,725	11.11	2,400	5.78	933	2,231
5	33 21	1,687	13.22	2,407	15.44	1,227	2,737
6	38.68	1,625	15.56	2,753	17.00	2,113	2,105
7	26.71	1,587	12.33	2,007	6.33	987	2,147
8	34.11	1,700	14.00	2,793	16.11	2,000	2,105
9	34.82	1,562	17.56	3,280	17.89	2,100	2,821
10	22.14	1,200	10.33	1,813	8.89	1,413	1,895
	25.44	1,525	10.70	2,112	6.08	975	1,918
	Increase per acre—Drained land						
2	4.82	85	1.67	397	4.07	289	210
3	13 82	407	2.56	517	6.09	401	295
5	19 37	437	3.28	578	11.56	929	645
6	19.99	560	5.06	796	13.55	981	1,586
8	29.16	879	4.72	965	10.73	1,048	715
9	31.79	1,458	6.94	1,159	13.76	1,378	1,642
	Increase per acre—Undrained land						
2	.96	—221	—.15	42	6.96	198	55
3	5.21	46	.15	125	7.81	869	—14
5	6.36	8	1.70	138	9.48	276	533
6	11.89	— 8	3.63	616	10.85	1,144	—69
8	8.92	242	2.33	851	8.93	871	42
9	11.15	233	6.56	1,402	9.85	829	842

wheat, and 2 of clover. The average yields and increase per acre of these crops together with those grown during the same seasons on the drained land, omitting crops grown in 1912 and 1913, are given in Table 37.

The drains in this work have been laid 30 inches deep and 54½ feet apart, at a total cost per acre, including mains, of 33.81. The interest an this cost at 6 percent would be $2.03 per annum, or a total of $8.12 for the 4 years of a rotation period.

The table mentioned shows that the unfertilized yields have been slightly higher on the undrained than on the drained land, thus indicating a somewhat superior natural fertility in the undrained land, and showing that drainage alone, without the help of other soil ameliorants, has been a waste of money.

It costs no more to plant and cultivate the land for a small yield than for a large one, but it does cost more to harvest and market the larger crop. In the next table this additional cost is estimated at 15 cents a bushel for corn and wheat, 20 cents a bushel for soybeans and $1 a ton for hay. The value of the increase is computed at half a dollar a bushel for corn, two dollars for soybeans, one dollar for wheat and ten dollars a ton for hay, as being probably fair average valuations for several years before the European war, and the cost of fertilizers is computed at $16 a ton for 16-percent acid phosphate, $50 a ton for muriate of potash, $60 a ton for nitrate of soda, and $3 a ton for ground limestone, all spread on the field, and manure at 50 cents a ton, to cover cost of hauling out and spreading. It is believed that these prices would have covered the necessary cost of fertilizing materials if bought in carloads.

While this experiment must be carried through at least another 4-year period before any but the most general conclusions can be drawn from it, the present indications are that drainage and liberal use of fertilizers and manure must go hand in hand if either is to accomplish its full purpose.

This particular farm had been used largely for the production of timothy hay for half a century before its selection for an experiment farm, the old Hillsboro-Cincinnati turnpike, on which it fronts, having afforded a good road, down hill most of the way, over which the hay was hauled to market. When first cleared from the forest it had evidently produced fair crops, judging from the buildings found on it which, though in ruins when the farm was purchased by the county, had once been a comfortable brick house and a very fair barn. But the plow sole had long ago obliterated the vertical drainage channels left by the decaying tree roots, and a century of

improvident husbandry, in which everything had been taken from the land and nothing returned, had left it thoroughly depleted of all the elements of fertility. Under these conditions drainage alone is money thrown away, as shown by the unfertilized yields. The addition of phosphorus, which as a rule is the first element required for the restoration of Ohio soils, has produced a small increase in yield, which has been greater on the drained than on the undrained land, but only half enough greater to pay the interest on the cost of drainage.

TABLE 38.—Value and cost of increase from treatment and net gain or loss per acre on drained and undrained land

Plot No.	Total value of increase	Cost of increase				Net gain or loss (—)
		Fertilizer	Harvesting	Interest	Total	
			Drained land			
2	$11.47	$ 4.00	$1.75	$8.12	$13.87	$—2.40
3	20.68	6.25	3.61	8.12	17.98	2.70
5	31.98	11.05	5.52	8.12	24.69	7.29
6	43.22	17.05	6.77	8.12	31.94	11.28
8	42.17	10.90	7.52	8.12	26.54	15.63
9	58.20	16.90	9.43	8.12	34.45	23.75
			Undrained land			
2	7.43	4.00	1.19	.....	5.19	2.24
3	11.68	6.25	1.71	.....	7.96	3.72
5	19.14	11.05	2.97	.....	14.02	5.12
6	25.46	17.05	3.90	.....	20.95	4.51
8	20.22	10.90	3.15	.....	14.05	6.17
9	35.21	16.90	4.58	.....	21.78	13.43

Potassium, when added to phosphorus, has brought up the yield of the drained land sufficiently to pay the interest on the drainage at the low valuation for potassium, but has left no margin for profit. At the present high cost of potash fertilizers the net gain has been less than that from phosphorus alone on the drained land and has altogether disappeared on the undrained land.

Nitrogen, added to the dressing of phosphorus and potassium, has increased the net gain on both drained and undrained land.

Lime, in ground limestone, has greatly increased the net gain on the drained land, but has not paid its cost on the undrained land, except when used as a supplement to manure.

The cost of manure in this table is computed at 50 cents a ton, or enough to cover the labor cost of hauling out and spreading. On this basis manure is by far the cheapest fertilizer. The total effect of manure has been twice as great on the drained as on the undrained land, so that manure has not taken the place of drainage.

The outstanding feature of this work is that on this impoverished soil phosphorus, potassium, nitrogen, lime and drainage are all required, and that no one of them can be omitted without loss in net gain.

When all these ameliorants have been employed, using manure as the carrier of nitrogen and potassium on the basis of the labor cost of its application only, the cost of the phosphorus and lime and nearly half that of the drainage have been recovered at the valuations above used, in the first rotation.

EFFECT OF HIGH PRICES ON THE USE OF FERTILIZERS

The question will be asked whether the high prices now current for farm produce might not justify a larger expenditure in drainage and fertilizing. In the next table the results of this test are arranged on the basis of $1 a bushel for corn, $2 for wheat, $4 for soybeans and $20 a ton for hay. Acid phosphate is rated at $24 a ton, muriate of potash at $350, nitrate of soda at $100. Ground limestone is rated at $3 a ton and manure at 75 cents. The estimated cost of harvesting increase of crop is increased by 50 percent.

TABLE 39.—Value and cost of increase from treatment and net gain or loss per acre on drained and undrained land, estimated at higher valuations

Plot No.	Total value of increase	Cost of increase				Net gain or loss(—)
		Fertilizer	Harvesting	Interest	Total	
			Drained land			
2	$22.94	$ 6.00	$ 2.62	$8.12	$16.74	$ 6.20
3	41 36	21 75	5.41	8.12	35.28	6.08
5	63.96	29.75	8.28	8.12	46.15	17.81
6	86.44	35.75	10.15	8.12	54.02	32.42
8	84.34	23.50	11.28	8 12	42.90	41.44
9	116.40	29.50	14.14	8.12	51.76	64.64
			Undrained land			
2	14.86	6.00	1.78	.....	7.78	7.08
3	23.36	21.75	2.56	.....	24.31	— .95
5	38.28	29.75	4 40	....	34.15	4.13
6	50.92	35.75	5.85	.....	41.60	9.32
8	40.44	23.50	4.72	....	28.22	12.22
9	70.42	29.50	7.32	.....	36.82	33.60

In these valuations there is less advance in the price of nitrate of soda than in that of either acid phosphate or muriate of potash, but both nitrogen and potassium are rated much lower than the prices at which they are usually sold in ready-mixed fertilizers.

At these higher valuations the cost of potassium has been barely recovered on the drained land, and it has been used at a loss on the undrained land. Nitrogen has largely increased the net gain

on the drained land, but has fallen below acid phosphate alone on the undrained land, while manure, reinforced with acid phosphate and supplemented with lime and chemical fertilizers, has increased the net gain on the drained land to a point sufficient to pay the entire cost of drainage in this first 4-year period.

THE POTATOES-WHEAT-CLOVER ROTATION

The outcome of this rotation is shown in Tables 40 and 36. The yield of potatoes on the untreated land has been very low, as is to be expected in this latitude and on such an impoverished soil as that under experiment.

Acid phosphate has produced a marked increase in yield, the increase in potatoes alone paying the cost of the phosphate used on both potatoes and wheat, if potatoes be valued at 50 cents a bushel or over.

Muriate of potash has produced a further increase, which would be a profitable one if the muriate were rated at its pre-war price of about 2½ cents a pound, but at the present cost of around 25 cents a pound the profit is turned into loss.

Nitrate of soda has apparently depressed the yield not only of potatoes but of wheat also, a result which is so different from that shown in the other experiments on this farm and elsewhere as to call for a further continuance of the work before attempting to draw any conclusions on this point.

There would seem to be no reason to question the effect of manure, nor of reinforcing the manure with acid phosphate, which has been done in this case not by mixing the phosphate with the manure, but by applying it separately when planting the potatoes.

The effect on the wheat crop of a preceding potato crop is the usual one of a marked increase in the yield of wheat over that following corn or oats. The 3-year average yield on the manured land of 28 bushels per acre is suggestive of the possibilities of wheat production on Clermont County soil.

TABLE 40.—Fertilizers and manure on POTATOES and WHEAT in potatoes-wheat-clover rotation, Clermont County Experiment Farm
Yield and increase per acre

Plot	Treatment per acre	1916				1917				Average			
		Yield		Increase		Yield		Increase		Yield		Increase	
		Potatoes or wheat	Straw	Potatoes or wheat	Straw	Potatoes or wheat	Straw	Potatoes or wheat	Straw	Potatoes or wheat	Straw	Potatoes or wheat	Straw
	Potatoes	Block R				Block P				4-year average			
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*
1	None	46.00				35.00				42.92			
2	Acid phosphate, 200 lb	47.33		1.77		55.00		15.67		55.91		10.75	
3	Acid phosphate, 200 lb.; muriate potash, 100 lb	51.00		5.89		79.33		35.66		63.75		16.33	
4	None	44.67				48.00				49.67			
5	Acid phos., 200 lb.; mur. pot., 100 lb.; nit. soda, 100 lb.	46.00		.33		65.00		17.44		56.33		6.69	
6	Acid phos., 400 lb.; mur. pot., 200 lb.; nit. soda, 200 lb.	54.67		8.00		81.33		34.22		66.08		16.47	
7	None	47.67				46.67				49.58			
8	Untreated manure, 8 tons	59.33		12.44		106.33		63.44		74.16		25.55	
9	Untreated manure, 8 tons; acid phosphate 200 lb	51.67		5.56		112.00		72.89		82.08		34.45	
10	None	45.33				35.33				46.66			
	Average unfertilized yield	45.92				41.25				47.21			
	Wheat	Block Q				Block R				3-year average			
1	None	10.33	980			16.67	1,000			14.89	1,187		
2	Acid phosphate, 200 lb	14.67	1,320	6.01	507	23.67	1,780	9.56	927	22.67	2,240	8.08	969
3	Acid phosphate, 200 lb.; muriate potash, 100 lb	18.33	1,300	11.33	653	24.67	2,420	13.11	1,713	26.44	2,613	12.14	1,258
4	None	5.33	480			9.00	560			14.00	1,440		
5	Acid phos., 200 lb.; mur. pot., 100 lb.; nit. soda, 100 lb.	11.33	1,280	5.78	867	28.00	2,520	15.67	1,593	23.33	2,407	8.30	911
6	Acid phos., 400 lb.; mur. pot., 200 lb.; nit. soda, 200 lb.	13.33	1,200	7.55	853	25.33	1,980	9.66	687	25.00	2,613	8.92	1,062
7	None	6.00	280			19.00	1,660			17.11	1,607		
8	Manured on potatoes	15.67	1,760	9.67	1,427	29.33	3,040	11.44	1,580	28.56	3,520	12.22	2,040
9	Manured on potatoes	16.33	1,920	10.33	1,533	28.33	3,700	11.55	2,440	28.11	3,700	12.55	2,347
10	None	6.00	440			15.67	1,060			14.78	1,227		
	Average unfertilized yield	6.91	545			15.08	1,070			15.17	1,365		

GENERAL CONCLUSIONS

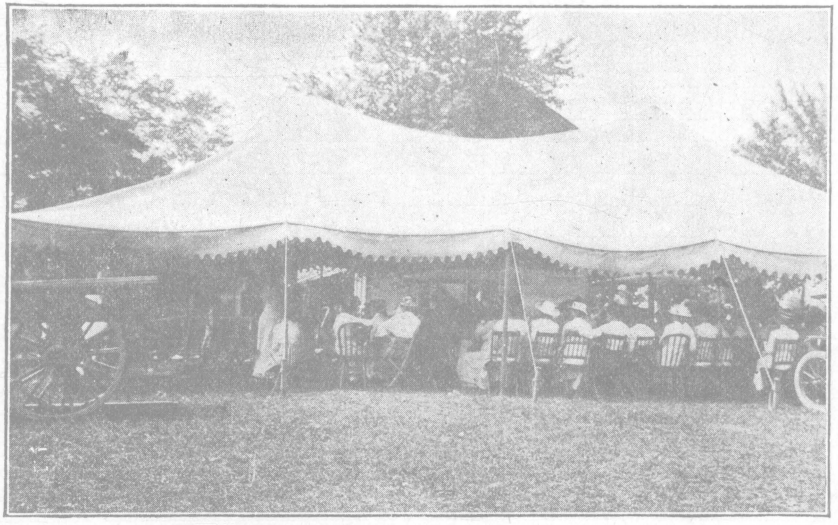
Even at this early stage of this work it would seem that the following conclusions respecting the treatment of the soil of this upland plateau are justified:

(1) Underdrainage, properly done, will assuredly pay a large interest on its necessary cost, provided it is followed by liberal use of manure, lime and fertilizers with systematic rotation of crops.

(2) This soil has been depleted by its previous management of all the principal elements of fertility—lime, phosphorus, potassium and nitrogen—and all must be supplied before the maximum profit in crop production can be attained.

(3) Under present conditions the cost of commercial potash fertilizers is prohibitive, but the place of potash can be sufficiently filled by the systematic saving and use of stable manure.

(4) The effect of manure may be materially and profitably augmented by reinforcing it with phosphorus, either by mixing acid phosphate with the manure or by applying it separately.



Field meeting, Clermont County Experiment Farm

COMPARISON OF VARIETIES

DEPARTMENT OF AGRONOMY

CORN

Six varieties of corn have been tested for 5 seasons. For the 5-year average, Orcutt's Reid stands highest in yield; Darke County Mammoth, second; Leaming, third, and Clarage, fourth.

TABLE 41.—Comparison of varieties of CORN, Clermont County Experiment Farm

Variety	Yield per acre, bushels					Average	
	1913	1914	1915	1916	1917	Grain	Stover or straw
Corn							
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb.*
Leaming	29.83	34.62	34.13	17.36	20.88	27.36	1,325
Clarage	28.71	35.70	30.51	19.07	17.78	26.39	1,317
White Cap	29.69	26.23	28.75	16.36	13.97	23.00	1,312
Cook's 75	28.02	37.47	29.32	19.21	15.11	25.83	1,470
Reid (Orcutt)	29.30	40.72	35.32	17.80	21.43	28.91	1,652
Leaming-Cuppy	28.11	37.88	.....	.....	.....	.....	.....
Darke County Mammoth	31.74	33.85	35.75	20.79	19.25	28.28	1,406
Ohio 84	.....	.....	29.18	20.63	15.49	.....	.....
Oats							
Big Four	16.48	16.87	43.35	21.85	40.67	27.84	1,552
Silver Mine	15.13	16.98	36.90	21.33	40.36	26.14	1,112
Swedish Select	4.61	10.84	41.48	17.58	38.02	22.51	1,226
Ohio 7009	.....	23.43	36.43	15.29	39.00	28.54	777
Ohio 6203	9.40	12.18	44.55	22.37	38.80	25.46	1,314
Ohio 6222	10.96	6.87	39.12	20.18	37.39	22.90	1,188
Wideawake	12.11	16.25	36.69	20.08	34.90	20.01	1,647
Wheat							
Nigger	.....	13.74	23.28	13.95	12.28	15.81	1,402
Mediterranean	.....	14.92	20.61	11.29	8.94	13.94	1,425
Rudy	.....	14.42	15.88	8.70	8.36	11.84	1,198
Turkey Red	.....	8.47	11.83	7.28	11.94	9.88	1,105
Gladden	.....	13.57	21.39	14.61	14.11	15.92	1,696
Portage	.....	19.53	18.66	9.03	8.86	14.02	1,317
Velvet Chaff	.....	13.58	18.67	10.28	12.78	13.83	1,333
Trumbull	.....	.....	.....	7.12	5.11	.....	.....
Soybeans							
Elton	.....	.....	5.95	7.61	5.21	6.26	1,283
Mongol	.....	.....	7.62	10.44	7.60	8.55	1,953
Ebony	.....	.....	6.23	3.56	8.21	6.00	1,403
Ohio 9100	.....	.....	2.78	4.06	4.88	3.91	1,223
Ohio 9035	.....	.....	6.84	4.78	7.21	6.28	1,713
Medium Green	.....	.....	7.12	5.67	3.54	5.44	1,484
New Era Cowpeas	.....	.....	.....	.33	1.50	.91	1,445

OATS

The test of varieties of oats has included 6 for the full 5-year period and 1 for 4 years. Averaging the yields, Ohio 7009 is first, Big Four, second, and Silver Mine, third.

WHEAT

A COMPARISON OF VARIETIES

Seven varieties of wheat have been tested for 4 years with the result that the Gladden stands highest in yield, Nigger, second, and Portage, third.

DATE OF SEEDING

Date of seeding tests have been conducted for 3 seasons, beginning September 8 and ending the last of October or first of November. The yields have varied widely owing mainly to seasonal conditions. On the average wheat seeded October 6 has given the highest yield, with October 12, second, September 29, third, and September 15, fourth.

TABLE 42.—Date and rate of seeding WHEAT, Clermont County Experiment Farm

Date of seeding	Yield per acre			Average	
	1915	1916	1917	Grain	Straw
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Lb.*
September 1		2.17	*		
September 8	16.00	2.50	*	9.25	1,195
September 15	22.50	6.50	11.33	13.44	1,393
September 22	13.17	4.83	8.67	8.89	917
September 29	28.33	6.83	6.33	13.83	1,297
October 5 and 6	34.17	13.33	5.00	17.50	1,620
October 12	32.17	12.33	4.00	16.17	1,447
October 19		5.67	4.33		
October 26 and 28	15.83	5.00	8.67	9.83	997
November 3	16.33				
Rate per acre, pecks					
Four	29.83	8.83	7.00	15.22	1,270
Five	32.83	12.00	9.33	18.05	1,550
Six	31.50	15.50	5.00	17.33	1,527
Seven	37.50	12.50	4.00	18.00	1,537
Eight	32.38	16.17	9.67	19.39	1,587

*No wheat

TABLE 43.—CORN, method of culture, Clermont County Experiment Farm

Method	Grain	Stover
	Bu.	*Lb.*
Ordinary plowing	38.63	2,596
Deep tillage	30.54	2,312

RATE OF SEEDING

Five rates of seeding were used 3 seasons, ranging from 4 to 8 pecks per acre. In 1915, 7 pecks per acre was the most profitable rate of seeding. In 1916, 8 pecks. The results in 1917 are very uneven. Averaging the three seasons, 8 pecks leads in net yield, with 5 pecks, second, and 7 pecks, third. With the evidence at hand, 7 or 8 pecks of seed per acre is indicated.

SOYBEANS

The yields of soybeans have been very low. Six varieties have been tested for 3 seasons, with the New Era cowpeas. The latter were cut for hay one season.

The Mongol soybeans were first in yield, Ohio 9035, second, and Elton, third.

BULLETIN

OF THE

Ohio Agricultural Experiment Station

NUMBER 323 MAY, 1918

COUNTY EXPERIMENT FARMS IN OHIO

PART IV

THE HAMILTON COUNTY EXPERIMENT FARM

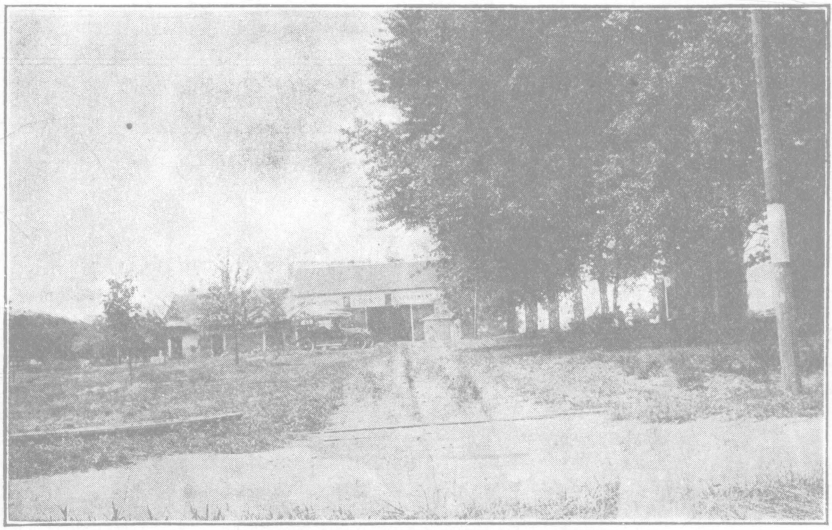
FIFTH AND SIXTH ANNUAL REPORTS, FOR 1916 AND 1917

C. W. MONTGOMERY, CHIEF

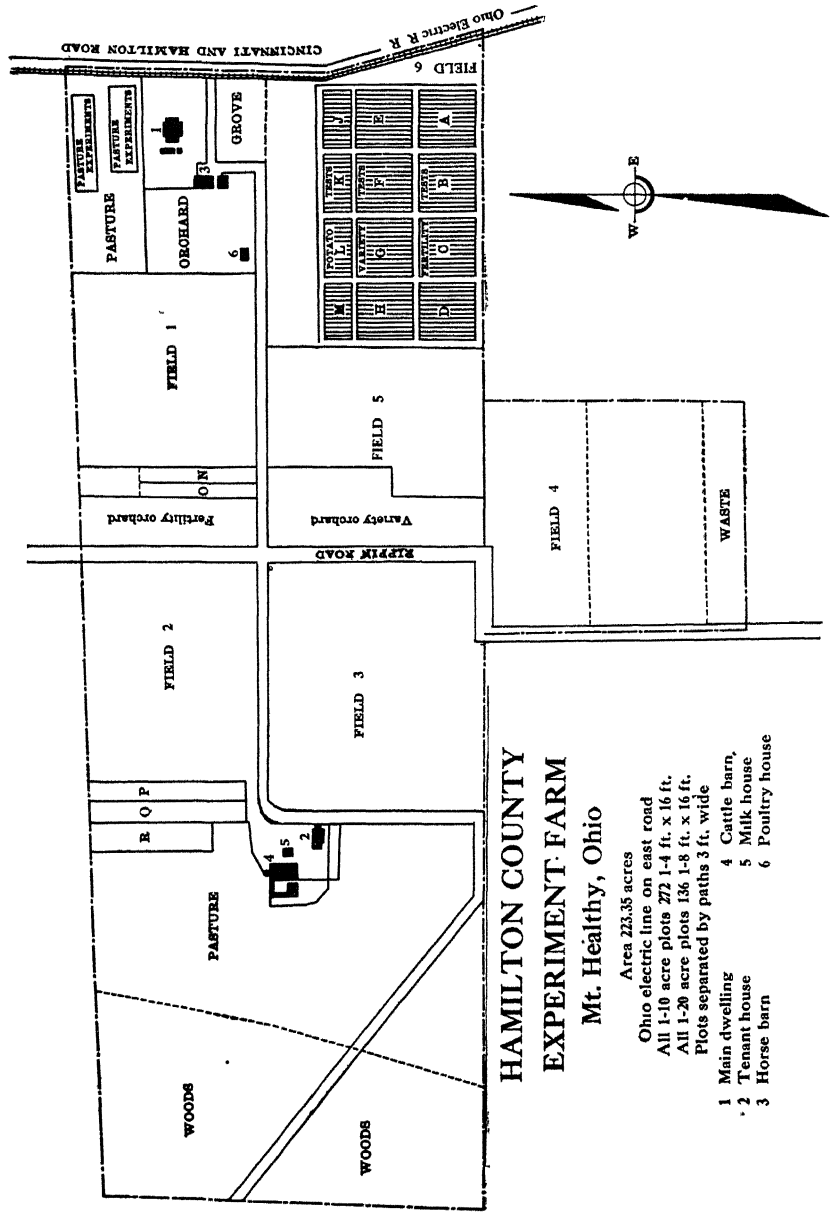
D. R. VAN ATTA AND W. J. SMITH, SUPERINTENDENTS
J. D. VAN HOUTEN AND MELBOURNE D. MOORE, FOREMEN

PERSONNEL

D. R. Van Atta resigned the superintendence of this farm July 1, 1917, and was succeeded in September by W. J. Smith. A. W. Huston was succeeded as foreman by J. D. Van Houten, December 15, 1916, and he by Melbourne D. Moore, September 15, 1917.



Entrance to Hamilton County Experiment Farm


CINCINNATI AND HAMILTON ROAD
Ohio Electric R. R.
FIELD 6
GROVE
PASTURE EXPERIMENTS
PASTURE
ORCHARD
FIELD 1
FIELD 5
FIELD 4
WASTE
Fertility orchard
Variety orchard
RIPPIK ROAD
FIELD 2
FIELD 3
PASTURE
WOODS
WOODS
N
E
W
HAMILTON COUNTY
EXPERIMENT FARM
Mt. Healthy, Ohio
Area 223.35 acres
Ohio electric line on east road
All 1-10 acre plots 272 1-4 ft. x 16 ft.
All 1-20 acre plots 136 1-8 ft. x 16 ft.
Plots separated by paths 3 ft. wide
1 Main dwelling
2 Tenant house
3 Horse barn
4 Cattle barn,
5 Milk house
6 Poultry house

HAMILTON COUNTY STATISTICS

POPULATION (U. S. Census)

	1870	1880	1890	1900	1910
Total	260,370	313,374	374,573	409,479	460,732
White	252,934	302,793	359,777	391,764	436,397
Negro	7,432	10,533	14,757	17,695	24,300
Foreign born	88,499	82,247	83,942	68,358	65,893
Rural	.....	.....	.....	59,711	53,473
Urban	.....	.....	.....	349,768	407,259

Population, 1910: Cincinnati, 363,591; Norwood, 16,185; Madisonville, 5,193; St. Bernard, 5,002; 17 villages of more than 1,000.

FARMS (U. S. Census)

	1880	1890	1900	1910
Approximate land area, Acres	.....	.....	.....	260,480
Land in farms, Acres	215,914	181,571	203,938	197,775
Improved land in farms, Acres	182,051	153,513	159,773	152,725
Woodland in farms, Acres	28,729	28,058	44,165	19,533
Other unimproved land in farms, Acres	5,134			25,517
Total number of farms, Number	4,064	3,227	4,111	4,129
Area of average farm, Acres	53.1	56.3	49.6	47.9
Improved land per farm, Acres	44.8	47.6	38.9	37.0
Value of all property per farm, Dollars	6,662	6,498	4,998	6,201
Value of land and buildings per farm, Dollars	6,216	5,991	4,500	5,545
Value of land and buildings per acre, Dollars	117.06	106.41	80.73	115.76

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses, Number	13,814	17,817	19,066	19,206	18,708	8,111
Cattle, Number	15,885	18,588	21,851	23,791	20,372	13,017
Sheep, Number	5,151	5,732	4,505	6,097	2,994	1,846
Hogs, Number	40,047	31,408	27,826	17,358	11,744	7,401
Cattle equivalent	.....	.....	243	295	254	144

FARM CROPS: 10-year average production (Ohio statistics)

Decennium	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn, acres	28,678	28,617	29,875	23,990	19,268	18,141
Bushels	1,097,284	1,066,755	1,088,498	804,510	590,176	600,758
Bushels per acre	38.2	37.5	36.4	33.3	30.6	33.1
Oats, acres	5,316	8,406	7,874	7,964	4,333	3,835
Bushels	88,486	180,774	157,768	172,655	89,779	103,183
Bushels per acre	16.7	21.5	20.0	21.6	20.7	26.9
Wheat, acres	11,389	12,961	9,154	12,805	16,859	13,888
Bushels	167,478	139,986	116,863	176,096	238,759	250,810
Bushels per acre	14.7	10.7	12.8	13.7	14.2	15.9
Rye, acres	737	789	1,556	1,282	865	722
Bushels	7,570	8,646	18,294	15,203	11,490	9,926
Bushels per acre	10.3	11.0	11.7	11.8	13.3	13.7
Meadows, acres	10,772	14,377	11,788	15,891	15,292	11,579
Tons	12,982	16,422	12,396	18,299	16,393	13,087
Tons per acre	1.22	1.14	1.05	1.15	1.07	1.13
Clover, acres	.....	2,632	3,186	4,174	4,429	3,719
Tons	.....	1,803	2,925	4,158	4,901	4,332
Tons per acre	.....	.69	.92	.99	1.11	1.16
Potatoes, acres	.....	4,843	4,432	4,644	4,731	3,897
Bushels	.....	282,594	253,481	303,251	321,193	366,270
Bushels per acre	.....	58.4	57.2	65.3	67.9	94.0
Orchards, acres	.....	1,564	5,527	4,207	3,606	2,186
Apples, bushels	.....	.....	152,889	101,071	461,166	16,309

PERMANENT IMPROVEMENTS

Made since establishment of farm in 1912

Item	Year completed	Estimated cost
Farm scale installed	1912	$ 125.00
Dwelling enlarged	1913	300.00
Barns remodeled	1913	600.00
Poultry house built	1913	225.00
Silo erected	1913	350.00
Tile drains	1914	4,500.00
Orchard planted (400 trees)	1913	80.00
Barn converted into dairy barn	1914	1,500.00
Milk house built	1914	250.00
Water system for front dwelling	1917	500.00
Water system for dairy barn and milk house	1917	350.00
Two drilled wells	1915-17	300.00
Total		$9,080.00

FINANCIAL SUMMARY

Inventory of Permanent Investment Costs and Operating Equipment
March 1, 1918

Land—original cost including buildings	$25,000.00	
Permanent improvements to date	9,080.00	
Total permanent investment		$34,080.00
Operating equipment:		
Livestock—6 horses $985; 19 cattle $1,200; 30 hogs 1,140; 127 chickens $175	$3,600.00	
Machinery, tools and harness	1,802.00	
Crops, feeds, etc.—corn $600; oats $125; wheat $420; soybeans $280; potatoes $10; hay $750; straw $120; alfalfa $25; silage $100; mill feed $60	2,490.00	
Seeds—clover $100; timothy $9; miscellaneous $5	114.00	
Fertilizer and limestone	105.00	
Building material—lumber $100; gravel $10	110.00	
Drain tile	65.00	
Containers—bags $75; barrels $5	80.00	
Sundries—fuel $3; posts $5; spray material $3	11.00	
Bedroom equipment	69.00	
Total operating equipment		8,446.00
Total investment		$42,526.00

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1917

RECEIPTS

From county treasury		$2,000.00
From farm sales:		
Livestock and livestock products—cattle $189.53; hogs $596.94; eggs $0.40; butterfat $814.96	$1,601.83	
Grain and beans—wheat $593.59; corn $75.76; oats $84.61; soybeans $24.38	778.34	
Forage crops—hay $654.23; straw $28.60; fodder $4.30	687.13	
Apples	36.65	
Potatoes	3.00	
		3,106.95
Miscellaneous receipts—spray material $40.20; custom scale weights $10.50; unclassified $3.78		54.48
Total receipts		$5,161.43

EXPENDITURES

For labor		$2,109.07
For current expense—seeds, etc. $280.85; fertilizer, lime, etc. $317; spray materials $75.01; blacksmithing and repairs $91.01; fuel and light $103.23; lubricants $1.55; painting $6.55; miscellaneous hardware $7.35; containers $25.70; telephone and telegraph $67.49; transportation $122.63; postage $16.46; household furnishing $$65.91; office supplies $5.40		1,186.14
For machinery and tools		147.59
For permanent improvement:		
Building material and construction	$35.86	
Water supply	500.61	
Fences	9.10	
Ornamental plants	4.65	
		550.22
For livestock:		
Purchases—hogs $174.80; cattle $568; poultry $46.90	789.70	
Maintenance—feeds $274.76; veterinary, medicine, etc $30.45; livestock fees $15	320.21	
		1,109.91
Total expenditures		5,102.93
Balance in county treasury February 28, 1917		58.50
		$5,161.43

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1918

RECEIPTS

From county:		
Balance in treasury March 1, 1917	$ 58.50	
Maintenance fund distribution	2,000.00	
		2,058.50
From farm sales:		
Livestock—hogs $802.55; calves $111.95; poultry $4.07.	918.57	
Livestock products—butterfat $855.93; milk $28.55; hides, etc. $8; eggs $54.95	947.43	
Crops—corn $337.40; oats $39.65; soybeans $83.25; wheat $951.14; potatoes $289.75; cabbage $68.73; hay $719.81; straw $42.28; apples $93.15	2,625.16	
Sundries—feed $6.40; paint $14.50; containers $17.53; spray material $31.48; seed corn $1; miscellaneous $1.03; scale drafts $7.70	71.94	
		4,570.80
Total receipts		$6,629.30

EXPENDITURES

For labor		$3,214.27
For current expenses—seeds $143.94; feeds $549.91; fertilizers $3; spray material $84.41; containers $6.65; binding material $60.75; threshing, etc. $214.49; livestock equipment $87.77; veterinary services $77.76; livestock fees $19.90; milk tickets $10.55; implement repairs $82.57; engine maintenance $67.10; horse shoeing and equipment $99.51; building renewal and repair $359.51; water system mbaintenance $46.22; sawing lumber $20; office maintenance $63.07; communication $100.80; transportation $16.24; publicity $18.84; miscellaneous hardware $15.77		2,148.76
For permanent improvement:		
Drainage material	$ 34.35	
Fence material	18.13	
Building material	19.48	
Concrete material	51.70	
Water system—material and construction	832.61	
Ornamental planting	16.49	
		972.76
For machinery and tools—engine $41; general implements $62.23		103.23
For livestock—poultry		133.65
Total expenditures		$6,572.67
Balance in treasury February 28, 1918		31.59
In hands of superintendent for payment of small bills		25.04
		$6,629.30

CROP AND LABOR STATISTICS OF THE HAMILTON COUNTY EXPERIMENT FARM FOR 1916

Area of farm, 223.35 acres
Acres cultivated, 135.98 acres
Permanent pasture, 39.25 acres
Woodland, 27.25 acres
Waste, 6.9 acres
Roads (farm), 4.7 acres
Roads (public), 2.1 acres
Yards and grove, 7.17 acres

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK				
Corn: silage—not ensiled	2	2.	29,280 lb.	7.45 tons
Corn: grain	26	2.6	7,155 lb.	39.31 bu.
Oats	11	1.1	1,028 lb.	35.69 bu.
Barley	1	.1	85 lb.	17.71 bu.
Emmer	1	.1	72 lb.	22.5 bu.
Soybeans	25	2.5	1,455 lb.	9.7 bu.
Cowpeas	1	.1	16 lb.	2.66 bu.
Wheat	48	3.7	3,981 lb.	22.44 bu.
Hay: timothy and clover	26	2.25	10,460 lb.	2.32 tons
soybean—ensiled	1	1.	2,180 lb.	1.09 tons
Potatoes	29	1.72	6,907 lb.	67. bu.
Alfalfa	22	1.55	9,210 lb.	2.97 tons
Total plot acres	193	18.72	.....	.....
FIELD WORK				
Corn: silage	.....	13.	130,000 lb.	5. tons
Corn: grain	.....	17.	40 936 lb.	34.4 bu.
Oats	.....	14.	422.5 bu.	33.14 bu.
Soys: beans	.....	2.5	1,371 lb.	9.14 bu.
silage	.....	2.	9,000 lb.	2.25 tons
Wheat	.....	22.	19,800 lb.	15.71 bu.
Hay: timoihy and clover	.....	22.	104,000 lb.	2.36 tons
soybean	.....	4.5	20,000 lb.	2.2 tons
oat and pea	.....	2.16	5,915 lb.	1.37 tons
Potatoes	.....	.6	25 bu.	41.66 bu.
Apples	.....	16.48	75 bu.	
Unharvested area:				
Drowned out in field 4	.....	1.	.....	.....
Total crop acres	.....	135.96	.....	.....
Less plot acres	.....	18.72	.....	.....
Total field acres	.....	117.24	.....	.....

	Corn *Bu.*	Oats *Bu.*	Soys *Bu.*	Wheat *Bu.*	Hay *Lb.*	Potatoes *Bu.*
Lowest yielding plots per acre	14.29	22.8	6.17	6.67	567.57	53.75
Highest yielding plots per acre	54.29	35.	21.67	31.33	6,919.	106.33

Number work horses used on Hamilton County Experiment Farm in 1916.....7
Number crop acres per work horse.....19.42
Number horse hours per year (March 1, 1916 to February 28, 1917 inclusive).....8,304.25
Number man hours per year (March 1, 1916 to February 28, 1917 inclusive).....12,429.50

CROP AND LABOR STATISTICS OF THE HAMILTON COUNTY EXPERIMENT FARM FOR 1917

Area in farm, 223.35 acres
Area in farmstead, 7.17 acres
Area cultivated, 142.46 acres
Permanent pasture, 39.25 acres
Woodland, 27.25 acres
Roads (public), 3.1 acres
Roads (farm), 4 acres
Waste, .11 acre

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK				
Corn	26	2.6	8,606 lb.	47.29 bu.
Oats	11	1.1	2,812 lb.	79.88 bu.
Barley	1	.1	234 lb.	48.75 bu.
Emmer	1	.1	91.5 lb.	28.59 bu.
Soybeans	25	2.5	2,378 lb.	15.85 bu.
Cowpeas	1	.1	45 lb.	7.5 bu.
Wheat	48	3.7	7,126 lb.	32.1 bu.
Hay (clover)	26+paths	2.25	9,389 lb.	2.11 tons
Alfalfa	9	.9	8,830 lb.	4.9 tons
Potatoes	13	.65	1,325 lb.	33.97 bu.
Cabbage	18	1.2	4,811 lb.	2. tons
Total plots and plot acres	179	15.2	.....	.....
FIELD WORK				
Corn (silage)	.....	14.	160,000 lb.	5.71 tons
Corn (grain)	.....	10.	650 bu.	65. bu.
Oats	.....	9.16	17,548 lb.	59.86 bu.
Soys (beans)	.....	2.	2,100 lb.	17.5 bu.
Soys (hay)	.....	9.75	40,000 lb.	2.05 tons
Oats and pea hay	.....	1.90	8,610 lb.	2.26 tons
Wheat	.....	27.55	42,815 lb.	25.90 bu.
Hay (timothy and clover)	.....	20.	80,000 lb.	2. tons
Orchards	.....	17.2	200 bu.	
Total crop acres	.....	111.56	.....	.....
Uncropped acres	.....	15.7	.....	.....
Total plot acres	.....	15.2	.....	.....
Total cultivated acres	.....	142.46	.....	.....

	Corn *Bu.*	Oats *Bu.*	Soybeans *Bu.*	Wheat *Bu.*	Clover hay *Tons*	Potatoes *Cu.*	Cabbage *Tons*
Lowest yielding plots per acre	22.5	71.25	10.84	14.17	1.13	17.5	.86
Highest yielding plots per acre	70.73	92.15	22.66	53.17	2.5	56.66	3.33

Number work horses used on Hamiton County Experiment Farm in 1917 6
Number crop acres per work horse 18.59
Number horse hours per year (March 1, 1917 to February 28, 1918 inclusive) ..... 7,061.
Number man hours per year (March 1, 1917 to February 28, 1918 inclusive) ..... 17,898.

SUMMARY DAIRY REPORT

June 1, 1916, to February 28, 1917

Debit		Credit	
Item	Value	Item	Value
1st inventory		2nd inventory	
Livestock $949.34		Livestock $1,029.00	
Dairy equipment.. 250.00		Dairy equipment	250.00
	$1,199.34	Livestock sold	110.75
Man labor (1,702¼ hrs. at 20c)	340.45	Cream sold	609.30
Horse labor (64 hrs. at 10c)	6.40	Milk sold	19.31
Feed used	441.11	Skimmilk sold	149.50
Fees	16.50	Manure produced	317.40
Livestock purchased	235.50		$2,485.26
Equipment purchased	5.00		
Interest on investment*.....	49.08		
To balance (gain)	191.88		
	$2,485.26		

Average number of cows kept for 9 months	10.6
Total labor cost including care of bull	$343.10
Average labor cost per cow	32.36
Average feed cost per cow	41.28
Total labor and feed cost per cow	73.64
Total income from milk, cream and calves per cow	75.45
Income over labor and feed expense per cow	1.84
Income per month over labor and feed expense per cow	.17
Total milk produced for 9 months	5,045.00 gal.
Labor and feed cost per gallon	$0.15⅔
Returns for milk per gallon	.15⅔

The following prices were used:

Corn and cob meal	0.01c per lb. or	$20.00 per ton
Ensilage	0.0025c per lb. or	$5.00 per ton
Nutritia	0.014c per lb. or	$29.00 per ton
Alfalfa	0.00575c per lb. or	$11.50 per ton
Wheat middlings	0.01c per lb. or	$20.00 per ton
Pasture	0.75c per day	
Cottonseed meal	0.0175c per lb. or	$35.00 per ton
Soybean hay	0.00575c per lb. or	$11.50 per ton
Oats	0.014c per lb. or	.45 per bu.

For calculating the value of manure:

Ammonia, 15c per lb.
Phosphoric acid, 5c per lb.
Potash, 5c per lb.

*Includes only investment in livestock and equipment. The figures for buildings and land were not obtainable at this time.

Note—The figure for the value of manure produced was obtained by computing the pounds of fertilizing constituents in the feeds consumed and multiplying three-fourths the number of pounds by the above prices. For computing pounds of fertilizing constituents in feeds a table was used found in the appendix to Henry and Morrison's "Feeds and Feeding."

AGRICULTURAL CONDITIONS OF HAMILTON COUNTY

D R. VAN ATTA

Hamilton County is located in the extreme southwestern corner of the State and comprises 260,480 acres of land. The population, as shown by the 1910 census, is 460,732. Of this number 53,473 persons live in the country and in towns of less than 2,500 population.

The topography is quite varied, ranging from level or gently rolling, to ridgy and rough land. The upland country of level land lies between the main drainage ways of the county and for the most part is undulating and rolling.

The sections comprising the hilly division of the county lie along the Indiana State line, the Ohio River, both sides of the two Miami Rivers and north and northwest of Cincinnati along Mill Creek. The land along the Ohio has been so deeply eroded that it is unfit for general farming, except in the wide delta valleys of the Miami and Little Miami Rivers. This land is covered with flood waters from the Ohio River each spring and a fresh deposit of soil is left. The land is planted to field corn after the spring rains are over.

The corn grown in the Big Miami Bottoms near Elizabethtown is mainly of the Johnson or Boone County White varieties. In an early day this corn was grown for starch factories and distilleries of Cincinnati and Lawrenceburg. Owing to the starch factories closing and the decrease in numbers of the distilleries, this corn has been cribbed by the growers or hauled to the local elevators, where it is stored and bought by Cincinnati grain commission merchants and shipped to other sections of the country. In the last three years more of this corn has been fed on the farms to hogs or purchased by large hog growers, who live in the northern part of the county near the villages of Harrison and New Haven, for the purpose of fattening hogs.

The corn grown along the Little Miami, in Turkey Bottoms, is mainly of a yellow dent variety which has been mixed with flint corn. The larger part of this corn is sold to the Cincinnati Stock Yards or to grain commission men.

The rough, hill land near the Ohio produces a very good quality of fruit and especially is this true of that lying along the Ohio River in Anderson Township, which is in the southeastern corner of the county. There are several good commercial orchards in this section of the county.

The upland depressions with poor drainage lie in the flat part of the uplands, mainly in the vicinity of Mt. Healthy, Rossmoyne, Norwood and Blue Ash, and north of Loveland. The soil is mainly Cincinnati and Rossmoyne silt loam formation, while in the northeastern part of the county near Loveland we find an outcropping of the Clermont silt loam formation.

The Cincinnati and Rossmoyne silt loam requires tile drainage to produce good crops. There are only a few farms tiled, but where the tile has been put in excellent crops are being produced. The application of lime, barnyard manure and acid phosphate gives good results.

The Cincinnati silt loam is of fine texture but grows good blue grass, while the Rossmoyne silt loam is coarser and very acid and the blue grass soon runs out.

In the vicinity of Mt. Healthy dairying and raising of corn, timothy, hay and potatoes with some fruit is the prevailing type of farming. The dairies range in size from 10 to 80 cows. These cows are purchased as springers in the Cincinnati stock yards by cow dealers, then sold to the dairymen. After they freshen the calf is either killed or vealed. The cow is milked out and fattened and then sold back to the dealer or taken to the yards and another fresh cow put in her place in the herd. This method of dairying is gradually being changed. A few of the younger and more progressive dairymen are buying grade Holsteins and mating them to a purebred Holstein male. However, there are a large number of the dairymen who do not believe in breeding and improving their herds and it will require several years to change their methods.

On the upland depressions near Blue Ash, Rossmoyne and Loveland the land has not been as well cared for as that near Mt. Healthy, and besides the Cincinnati and Rossmoyne silt loam we have the Clermont silt loam which lies very level and is much finer in texture than either of the other soils. It is almost white in color and the subsoil is gray and almost lifeless and impervious to water. Small pebbles of iron concretions are prevalent.

The type of farming is different around Blue Ash, Rossmoyne and Montgomery from that near Mt. Healthy. Most of the farmers keep from five to ten cows, raise a few potatoes, some small fruit, and timothy hay. They have their yearly customers in Kennedy Heights, Norwood, Walnut Hills and Madisonville, where they deliver their butter, buttermilk, Dutch cheese, eggs, potatoes and small fruits. This type of farming is gradually being changed to dairying on a larger scale. The milk is sold to the large distributors.

The foregoing type of farming practically holds true for Sycamore, Symmes and Columbia Townships with slight variations where better types of soil are found, such as the flat delta lands near Milford, Camp Dennison, Remington and Loveland, along the Little Miami River. Here the farmers are growing corn, wheat and clover. On the steep hillsides, alfalfa and tobacco are being raised. Some of these crops are fed to hogs and dairy cattle.

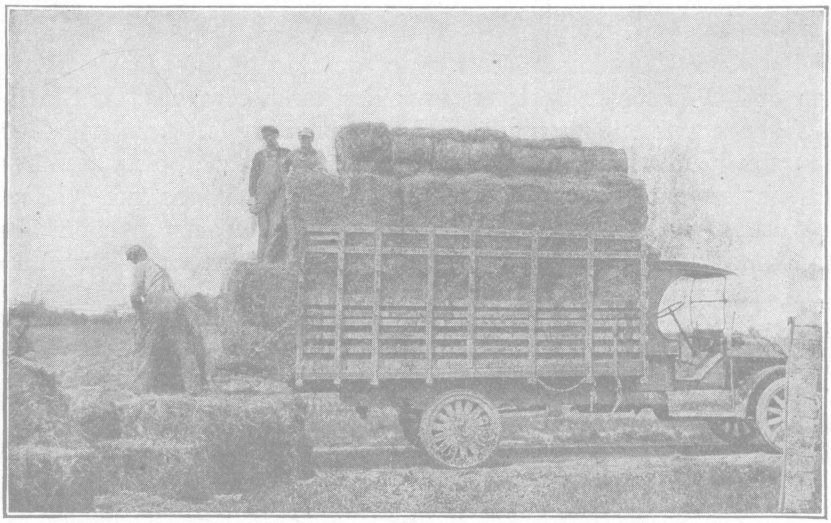
Along the Little Miami River on the Genesee loam and Fox fine sandy loam, near Newtown, the land used to be rotated with corn, wheat and clover. This rotation is gradually being changed. Potatoes are being placed in the rotation, likewise sugar corn, cabbage and tomatoes. Truck crops are fast taking the place of the general farm crops.

In general, Anderson Township, outside of the Little Miami River and Ohio River Bottoms, is rolling land, composed of Cincinnati, Rossmoyne silt loam, also Fairmount silty clay loam and Clermont silt loam. The farms are small. Berries, apples, peaches, plums, a few potatoes and a large amount of tomatoes and cabbage are raised. The products are hauled to commission men on Cincinnati markets. There are a few dairymen in this section whose farms indicate that the soil will respond to liberal applications of barnyard manure. Some commercial fertilizers have been used in this part of the county on tomatoes and fruit with good results. Some parts of the township are especially thickly settled by city people who have gone out along the traction lines and bought small tracts of land for homes where they can raise a garden and fruit and keep chickens.

Springfield Township is one of the best general farming areas in Hamilton County. The soils are of the Miami and Cincinnati silt loam formations, and are generally rolling enough to give fair drainage. However, there is a great deal of the farm land that has been partially tiled through the swales. More tile drains would help out some of the land very materially. The rotation practiced is corn, wheat and mixed hay. The wheat and part of the hay is sold while most of the corn is fed to hogs and cattle. Dairying seems to be on the increase in the northern half, while trucking is increasing near Glendale and Sharonville in the Sharon Bottoms. Years ago this land produced a large acreage of barley which was hauled to Cincinnati for brewing purposes. There is very little barley grown at present. The farms are of good size, the buildings in good repair and things generally look prosperous.

Colerain Township is very similar to Springfield; along the eastern and northern ends of the township general farming is practiced. The western and southern part of the township is rolling to very rough near the Big Miami River. The raising of sugar corn, potatoes, onions and musk melons is practiced. This land was planted to field corn up until the last 10 years, when truck crops began to be generally grown.

The steep hills near the Big Miami grow a fine quality of alfalfa. They also produce fine peaches, cherries and small fruits. There are more acres of apples, pears and peaches in Colerain Township than in any other part of Hamilton County. The prevailing soils



Loading hay for Cincinnati market, Hamilton County Experiment Farm

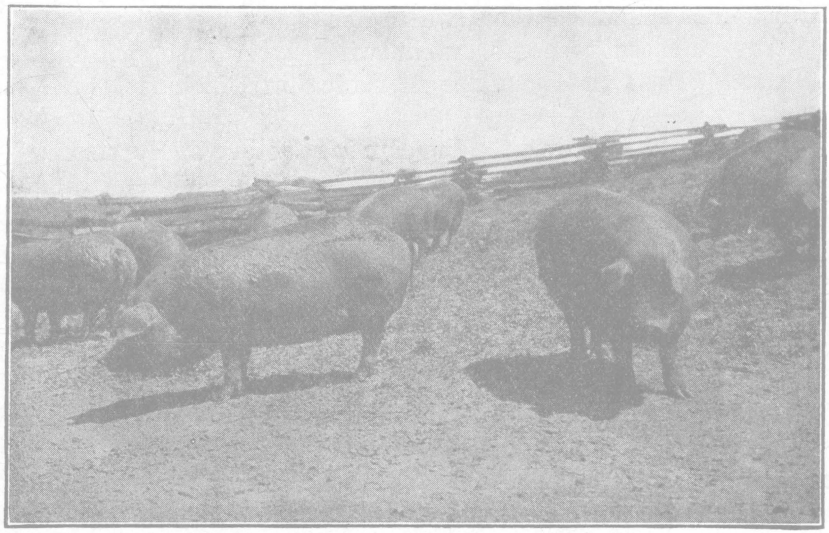
are of the Fairmount silty clay loam and Cincinnati silt loam types. The soils respond to good cultivation, and are probably in as high a state of cultivation at Peach Grove as in any part of the township. Here the farms are small, the families of good size and berries, peaches, potatoes and onions are the chief crops.

Miami, Green and Delhi Townships are very similar to Colerain Township in the type of soils and type of farming. There are not as many acres of fruit in these townships, but more truck is grown for the Cincinnati market.

In Green Township the farms are smaller than in any other part of the county. The truck crops are hauled to the markets and sold direct to private customers in Westwood and College Hill.

A great many chickens are raised; eggs and broilers are marketed along with the truck crops.

In Delhi Township we have some of the very best German truck gardeners. West of Price Hill a number of Skinner irrigating systems have been installed; while there are a large number of greenhouses for forcing vegetables to compete with the southern shipped truck crops. These men have been making money the last few years and their buildings indicate it. They haul manure from the Stock Yards and wherever they can get it to apply on their land. They are just beginning to use commercial fertilizers. There are a large number of florists in this neighborhood; carnations and



By-product of the Hamilton County Experiment Farm dairy

chrysanthemums being very generally grown. These men are very successful in their work.

Crosby Township has a type of soil unlike the other soils of the county; it is known as Crosby silt loam and occupies practically the whole of the township. It lies level and is naturally wet. It requires tile drainage for best results. There has been more tile put in during the last few years than ever before in this township. General farming is practiced. A rotation of corn, wheat and clover is followed. Large numbers of hogs are raised and a few cows are kept. Occasionally a car of cattle is fed for the Cincinnati market. The farms average over one hundred acres in size. Some fertilizers are being used on corn and wheat.

Harrison Township lies west of Crosby and has some of the Crosby silt loam in the eastern half, while the Fairmount silty clay loam occupies the northwestern corner, which is rough and rolling. The southern part of the township is made up of Fox loam and Fox fine sandy loam. These soils produce excellent corn, soybeans, wheat and clover. Soybeans are being placed in the rotation by some of the farmers. In the northwestern corner of the township livestock raising is practiced and a number of dairies are being developed; practically every one raises his own cows. Dairying seems to be increasing.

The soils of Whitewater Township are very similar to those of Harrison with the exception of the river bottoms along Whitewater River and Big Miami. Corn, which has always been the chief crop, is being replaced to some extent with sweet corn, potatoes and melons. These products are marketed in Cincinnati with auto trucks.

Tomatoes are grown for the canning factory at Harrison. The rough, hill land along the Indiana line has some fine apple orchards. Tobacco grows well on these hill slopes and is marketed at Lawrenceburg, Indiana. The growing of truck crops and dairying are increasing. Horse radish is being extensively grown in Big Miami Bottoms.

SUMMARY

As the population of Cincinnati increases and spreads out in the suburban districts along the good roads and interurban railroads, land increases in price. As a result, the German truck gardeners who used to till the fertile Mill Creek Bottoms are moving further out of the city, and as auto trucks have become of general use they locate from ten to fifteen miles away from the Cincinnati market. This accounts for the increase in trucking in the Little Miami Bottoms, near Newtown, and near Reading, Elmwood Place and as far out as Sharonville in Mill Creek Bottoms. Likewise, the increase in trucking near Cleves, Miamitown, New Baltimore and as far north as Venice along the Big Miami River. The auto trucks are not only hauling vegetables but are hauling hogs, cattle, corn, baled hay and in fact every other product that is raised on the farm to the Cincinnati market at reasonable prices.

The Cincinnati type of dairying, which has always occupied the steeper slopes along Mill Creek, West Fork and Kirby Road, is gradually decreasing, due to the high price of land, labor and feed, and to the fact that they cannot buy the good dual purpose Short-

horn cows that they used to buy in the Cincinnati market. Some of the dairymen are going out further from the city and buying larger tracts of land, while others are quitting the business entirely.

Farmers' organizations are playing an important part in agriculture at the present time.

The Farmers' Educational & Cooperative Union of America have a number of county local organizations comprising 2,000 members. This organization is buying and selling farm products together and meeting for social functions, which is an important factor of any farm organization.

Likewise the granges of the eastern part of the county and the Miami Valley Farmers' Club of Newtown are conducting some active cooperative work in buying and in social work, which is readily noticeable in the various communities in which they are operating.

The Experiment Farm, which is located six miles north of Mt. Healthy, on the Ohio Electric Interurban and the Cincinnati-Hamilton turnpike, comprises 223 acres of Miami and Cincinnati silt loam. These two types are the prevailing soils of Hamilton County. The land is comparatively level and admirably suited for experimental work. This soil responds to tile drainage and to the application of manure and acid phosphate. The farm is well located as it is easily reached by rail or by wagon road.

The Experiment Farm has a number of problems to help solve. It has been the earnest endeavor of those in charge to make the farm a place of experimental research, which would tend to solve the problems of all kinds of farming which have been pursued in Hamilton County. The fact that 53 percent of the farmers of the county are general farmers led the persons in charge to start experimental work on general farm crops. When the farm was started, two sets of four blocks comprising thirteen one-tenth acre plots each, were laid out. The first four were devoted to fertility work, the second four blocks to variety work; while a third tier of these blocks comprising thirteen twentieth acre plots each was laid out for a potato-wheat-clover rotation with different applications of fertilizers. The aim of these experiments was to meet the needs of the general farmers.

As the growing of fruit for Cincinnati market is of importance, an orchard of 12 acres was set out. Experiments on sod mulch and cultivation were started on apples, while 65 varieties of apples, 11 of plum and 22 of pears were planted. To this work have been added some experiments to determine the effect of different times of pruning, etc.

A poultry plant was built to help solve some of the problems of the poultry raiser, but owing to disease in the flock and lack of funds, this work had to be suspended for the present.

Dairying has been added in the last two years and a herd of twelve cows bought. The Jersey breed was selected, owing to the fact that this breed is so well distributed in the county on the general farms. A purebred Jersey bull of good size and quality was bought and mated to the grade Jersey cows, the object being to breed up the herd and do it in the same way that the average farmer could build up his herd.

Along with the dairy work experiments in the production of silage, soybeans and alfalfa have been started. The aim of this work is to meet the needs of the small dairyman on a small farm.

Seventeen experimental plots of one-twentieth acre each have been laid out on pasture work. Different applications of plant food, lime and methods of cultivation are being tried. Owing to the shortage of funds no work was started on truck crops until the spring of 1915. Two series of eight one-fifteenth acre plots each were laid out. One series is manured each year, while on the other a cover crop is grown.

In order to meet the problems of the truck growers it is planned, as funds are available, to increase the work on truck crops so that the farm will be of more general use in the county.

It has been the earnest desire of those in charge to make the farm of general use to the people of the county, and through the work which has been started a fair degree of success has been attained. The greatest obstacle so far has been that of labor. This is general in those counties where large cities are located, which take the labor from the country.

EXPERIMENTS IN THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

Two rotations are in progress on this farm; namely:

Rotation I: Corn, soybeans, wheat, clover.
Rotation II: Potatoes, wheat, clover.

The plan of fertilizing in these rotations is shown in Tables 43 and 51.

TABLE 43.—Plan of fertilizing in corn-soybeans-wheat-clover rotation, Hamilton County Experiment Farm

Plot	Treatment	Total cost per acre	Pounds per acre on		
			Corn	Soybeans	Wheat
1	None				
2	Acid phosphate	$ 3.75	200	100	200
3	Acid phosphate Muriate potash	6.00	200 50	100 20	200 20
4	None				
5	Acid phosphate Muriate potash Nitrate soda	10.00	200 50 50	100 20 30	200 20 80
6	Yard manure, untreated		5 tons		5 tons
7	None				
8	Shed manure, untreated		5 tons		5 tons
9	Shed manure, phosphated		5 tons		5 tons
10	None				
11	Shed manure, phosphated Ground limestone Shed manure, phosphated Ground limestone		5 tons 2 tons 5 tons 2 tons		5 tons
12	Acid phosphate Muriate potash Nitrate soda				200 50 50
13	None				

Note—The fertilizers, including the nitrate of soda, to be applied just before planting the crop. The manure to be plowed under for corn, but applied as a top dressing for wheat. The "phosphated" manure to be treated with 40 pounds of acid phosphate per ton of manure, the phosphate to be mixed with the manure before spreading.

FERTILIZERS AND MANURE ON CROPS GROWN IN ROTATION

ROTATION I: CORN-SOYBEANS-WHEAT-CLOVER

The corn crop of 1916 was the fourth corn crop grown in this experiment, the corn having been grown on previously unfertilized land each year, as there are as many tracts of land as there are crops in the rotation in these experiments in order that each crop may be grown every season. These 4 corn crops, therefore, represent the first treatment of the land. They indicate a small effect from acid phosphate, which is the usual outcome; the full effect, of this fertilizer especially, being seldom realized in the crop to which it is applied.

With 1917 the second course of treatment begins, and all the crops except the wheat show a greater regularity in their response to treatment.

TABLE 44, Part I.—Fertilizers, manure and lime on CORN, SOYBEANS, WHEATand CLOVER grown in rotation, Hamilton County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916				1917				Average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
	Corn	Block C				Block D				5-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	28.57	1,300	.....	.....	36.57	2,000	.....	.....	38.64	2,647	.....	.....	1
2	Acid phosphate, 200 lb	31.43	1,500	—.95	133	47.29	2,050	9.77	17	43.79	2,697	3.97	49	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	44.29	1,800	8.10	367	50.14	2,500	11.66	433	50.51	2,666	9.53	16	3
4	None	40.00	1,500	.....	.....	39.43	2,100	.....	.....	42.16	2,651	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	45.71	1,700	7.14	67	52.00	2,850	11.52	717	49.61	2,845	7.41	216	5
6	Yard manure, untreated, 5 tons	50.00	1,800	12.86	33	53.14	2,750	11.62	583	50.93	2,939	8.68	332	6
7	None	35.71	1,900	.....	.....	42.57	2,200	.....	.....	42.30	2,585	.....	.....	7
8	Shed manure, untreated, 5 tons	43.57	1,800	10.24	0	59.00	3,050	16.43	817	55.63	3,042	14.05	500	8
9	Shed manure, phosphated, 5 tons*	45.71	1,800	14.76	100	65.86	3,500	23.29	1,233	55.02	3,031	12.03	532	9
10	None	28.57	1,600	.....	.....	42.57	2,300	.....	.....	40.14	2,456	.....	.....	10
11	Shed manure, phosphated, ground limestone, 2 tons	40.00	1,800	16.19	300	68.71	3,400	30.62	1,250	50.10	3,155	12.63	801	11
12	Shed manure, phosphated, ground limestone, 2 tons	35.71	1,800	16.66	400	54.43	3,300	20.81	1,300	52.31	3,090	17.52	838	12
13	None	14.29	1,300	.....	.....	29.14	1,850	.....	.....	32.11	2,150	.....	.....	13
	Average unfertilized yield	29.43	1,520	.....	.....	38.06	2,090	.....	.....	39.07	2,498	.....	.....	

*40 lb. acid phosphate per ton of manure

TABLE 44, Part II.—Fertilizers, manure and lime on CORN, SOYBEANS, WHEAT and CLOVER grown in rotation, Hamilton County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre	1916				1917				Average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Soybeans	Block B				Block C				4-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	9.00	2,160	.....	.....	12.17	1,520	.....	.....	9.10	1,584	.....	.....	1
2	Acid phosphate, 100 lb	8.17	1,760	—.27	—167	16.17	1,980	3.06	433	10.17	1,540	.66	53	2
3	Acid phosphate, 100 lb.; muriate potash, 20 lb	7.17	1,470	—.72	—223	20.83	2,250	6.77	677	11.41	1,640	1.49	250	3
4	None	7.33	1,460	.....	.....	15.00	1,600	.....	.....	10.33	1,292	.....	.....	4
5	Acid phos., 100 lb.; mur. potash, 20 lb.; nitrate soda, 30 lb.	9.50	1,580	1.89	70	18.17	2,110	3.67	497	12.02	1,554	1.66	217	5
6	Yard manure on corn	8.17	1,410	.28	—150	16.67	1,950	2.67	323	11.31	1,409	.94	27	6
7	None	8.17	1,610	.....	.....	13.50	1,640	.....	.....	10.40	1,426	.....	.....	7
8	Shed manure on corn	7.67	1,440	—.17	—190	17.00	3,280	3.33	1,583	11.59	1,857	1.39	411	8
9	Shed manure, phosphated, on corn	8.17	1,660	.67	10	15.83	2,100	2.00	347	11.85	1,651	1.84	185	9
10	None	7.17	1,670	.....	.....	14.00	1,810	.....	.....	9.81	1,486	.....	.....	10
11	Shed mauure, phosphated, and limestone on corn	8.83	1,620	1.99	63	12.00	1,930	—1.06	230	11.29	1,572	1.85	164	11
12	Shed manure and limestone on corn, fertilizers on wheat	8.00	1,720	1.50	277	10.83	1,450	—1.28	—140	9.62	1,510	.56	179	12
13	None	6.17	1,330	.....	.....	11.17	1,480	.....	.....	8.69	1,254	.....	.....	13
	Average unfertilized yield	7.57	1,646	.....	.....	13.17	1,610	.....	.....	9.67	1,408	.....	.....	

TABLE 45, Part I.—Fertilizers, manure and lime on CORN, SOYBEANS, WHEAT and CLOVER grown in rotation: Hamilton County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre on wheat	1916				1917				Average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
	Wheat	Block A				Block B				4-year average				
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	12.67	1,340	.....	.....	15.25	1,185	.....	.....	13.42	1,395	.....	.....	1
2	Acid phosphate, 200 lb	17.17	1,570	3.50	207	24.17	1,900	8.59	735	22.62	1,992	8.56	590	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb	19.00	1,660	4.33	273	27.17	2,520	11.25	1,375	24.63	2,254	9.92	844	3
4	None	15.67	1,410	.....	.....	16.25	1,125	.....	.....	15.35	1,416	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 20 lb.; nitrate soda, 80 lb.	24.17	2,400	8.33	983	26.50	1,960	8.39	697	26.13	2,582	10.38	918	5
6	Yard manure, untreated, 5 tons	21.33	2,120	5.33	697	20.00	1,750	.03	348	21.33	2,295	4.20	569	6
7	None	16.17	1,430	.....	.....	21.83	1,540	.....	.....	18.02	1,881	.....	.....	7
8	Shed manure, untreated, 5 tons	20.50	1,870	4.89	507	23.67	2,480	2.31	978	22.48	2,526	5.15	745	8
9	Shed manure, phosphated, 5 tons	22.17	2,370	7.11	1,073	23.50	1,990	2.61	527	25.83	2,706	9.20	1,025	9
10	None	14.50	1,230	.....	.....	20.42	1,425	.....	.....	15.94	1,581	.....	.....	10
11	Shed manure, phosphated, 5 tons	22.33	2,160	7.83	930	20.75	2,255	2.41	922	22.89	2,751	10.22	1,245	11
12	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb. (Phosphated manure and limestone on corn)	24.33	2,290	9.83	1,060	29.00	2,510	12.75	1,268	27.56	2,696	13.15	1,265	12
13	None	.....	.....	.....	.....	14.17	1,150	.....	.....	13.36	1,398	.....	.....	13
	Average unfertilized yield	14.75	1,352	.....	.....	17.58	1,285	.....	.....	15.28	1,532	.....	.....	

TABLE 45, Part II.—Fertilizers, manure and lime on CORN, SOYBEANS, WHEAT and CLOVER grown in rotation: Hamilton County Experiment Farm. Yield and increase per acre

Plot	Clover: Total fertilizing materials applied to previous crops of rotation	1916 Block D Yield	1916 Block D Increase	1917 Block A Yield	1917 Block A Increase	3-year average Yield	3-year average Increase	General summary: Value of increase, cost of treatment and net gain or loss for one rotation — Value of increase Low	Value of increase High	Cost of treatment Low	Cost of treatment High	Net gain or loss (—) Low	Net gain or loss (—) High	Plot
		Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Doll.*	*Doll.*	*Doll.*	*Doll.*	*Doll.*	*Doll.*	
1	None	5,067	.....	1,946	.....	3,347	.....	.....	.....	.....	.....	.....	.....	1
2	Acid phosphate, 500 lb	4,622	—178	3,027	706	3,674	263	13.17	26.34	4.00	6.00	9.17	20.34	2
3	Acid phosphate, 500 lb.; muriate potash, 90 lb	4,444	— 90	3,589	894	3,946	470	20.69	41.38	6.25	28.50	14.44	12.88	3
4	None	4,267	.....	3,070	.....	3,541	.....	.....	.....	.....	.....	.....	.....	4
5	Acid phos., 500 lb.; mur. potash, 90 lb.; nit. soda, 160 lb	4,533	207	3,935	778	4,293	689	20.84	41.68	11.05	36.50	9.79	5.18	5
6	Yard manure, untreated, 10 tons	4,622	237	3,849	606	4,496	829	14.56	29.12	5.00	7.50	9.56	21.62	6
7	None	4,444	.....	3,330	.....	3,730	.....	.....	.....	.....	.....	.....	.....	7
8	Shed manure, untreated, 10 tons	5,333	800	4,108	634	5,035	1,213	21.01	42.02	5.00	7.50	16.01	34.52	8
9	Shed manure, phosphated, 10 tons*	4,178	—444	4,108	490	4,290	376	20.77	41.55	8.20	12.30	12.57	29.25	9
10	None	4,711	.....	3,762	.....	4,006	.....	.....	.....	.....	.....	.....	.....	10
11	Shed manure, phosphated, 10 T.; ground limestone, 2 T.	4,000	—681	4,324	894	4,591	705	23.75	47.50	14.20	19.30	9.55	28.20	11
12	Shed manure, phosphated, 5 T.; ground limestone, 2 T.; acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.	4,089	—563	4,324	1,225	4,073	307	24.56	49.12	14.45	30.55	10.11	18.57	12
13	None	4,622	.....	2,767	.....	3,645	.....	.....	.....	.....	.....	.....	.....	13
	Average unfertilized yield	4,622	.....	2,975	.....	3,654	.....	.....	.....	.....	.....	.....	.....	

*40 lbs. acid phosphate per ton of manure.

TABLE 46, Part I.—Fertilizers and manure on POTATOES and WHEAT grown in rotation with clover, Hamilton County Experiment Farm
Yield and increase per acre

Plot	Treatment per acre on wheat	Wheat												Plot
		1916				1917				3-year average				
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	22.00	2,280	.....	.....	44.67	5,180	.....	.....	31.33	3,673	.....	.....	1
2	Acid phosphate, 200 lb	32.67	3,040	10.00	867	52.33	5,460	10.55	513	39.22	4,313	9.07	816	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	30.33	2,380	7.00	313	53.00	4,620	14.11	—93	42.33	4,227	13.37	904	3
4	None	24.00	1,960	.....	.....	36.00	4,480	.....	.....	27.78	3,147	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	28.67	2,580	5.45	573	48.83	4,770	11.55	460	39.28	4,410	10.93	1,229	5
6	Acid phos., 400 lb.; mur. potash, 100 lb.; nit- soda, 100 lb.	30.00	2,200	7.55	147	50.83	5,830	12.28	1,690	41.28	4,617	12.35	1,401	6
7	None	21.67	2,100	.....	.....	39.83	3,970	.....	.....	29.50	3,250	.....	.....	7
8	Manure, 8 tons	34.00	3,060	11.22	993	45.00	5,200	5.78	1,400	40.11	4,793	10.78	1,691	8
9	Manure, 8 tons; acid phosphate, 200 lb	37 33	3,560	13.44	1,527	53.17	5,510	14.56	1,880	43.50	5,250	14.33	2,296	9
10	None	25.00	2,000	.....	.....	38.00	3,460	.....	.....	29.00	2,807	.....	.....	10
11	Manure, 8 tons, acid phos., 200 lb.; muriate potash, 50 lb.	.....	.....	.....	.....	53.17	5,610	13.34	2,073	.....	.....	.....	.....	11
12	Manure and acid phosphate on potatoes only	.....	.....	.....	.....	49.50	5,430	7.83	1,817	.....	.....	.....	.....	12
13	None	.....	.....	.....	.....	43.50	3,690	.....	.....	.....	.....	.....	.....	13
	Average unfertilized yield	23.17	2,085	.....	.....	40.40	4,156	.....	.....	29.74	3,180	.....	.....	

TABLE 46, Part II.—Fertilizers and manure on POTATOES and WHEAT grown in rotation with clover, Hamilton County Experiment Farm
Yield and increase per acre

Plot	Treatment per acre on potatoes	Potatoes						Clover						Plot
		1916		1917		4-year average		1916		1917		2-year average		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
		Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	
1	None	58.33	.....	20.17	.....	108.16	.....	6,044	.....	3,772	.....	4,908	.....	1
2	Acid phosphate, 200 lb	59.33	.22	24.00	4.72	89.91	—7.26	4,444	—1,304	5,154	1,123	4,799	— 90	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	65.33	5.44	27.00	8.61	94.08	7.89	5,333	— 119	5,154	863	5,243	372	3
4	None	60.67	.....	17.50	.....	75.21	.....	5,156	.....	4,550	.....	4,853	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nit. soda, 50 lb.	65.00	4.11	30.17	12.23	96.75	18.75	4,800	— 415	4,722	172	4,761	—121	5
6	Acid phos., 400 lb.; mur. potash, 100 lb.; nit. soda, 100 lb.	69.67	8.56	39.83	21.44	113.75	32.96	5,511	237	5,328	778	5,419	507	6
7	None	61.33	.....	18.83	.....	83.58	.....	5,333	.....	4,550	.....	4,941	.....	7
8	Manure, 8 tons	90.00	28.34	50.00	29.84	125.87	38.32	5,333	533	6,020	1,067	5,676	800	8
9	Manure, 8 tons; acid phosphate, 200 lb	89.33	27.33	56 67	35.17	141.21	49.68	7,111	2,845	6,798	1,441	6,954	2,143	9
10	None	62.33	.....	22.83	.....	95.50	.....	3,733	.....	5,760	.....	4,746	.....	10
11	Manure, 8 tons; acid phos., 200 lb.; mur. potash, 50 lb	105.67	43.59	55.83	32.44	*80.75	38.01	5,689	1,719	6,279	519	5,984	1,119	11
12	Manure, 8 tons; acid phosphate, 200 lb	106.33	44.51	54.17	30.23	*80.25	37.37	5,156	949	6,279	519	5,717	734	12
13	None	61.57	.....	24.50	.....	*43.03	.....	4,444	.....	5,760	.....	5,102	.....	13
	Average unfertilized yield	60.87	.....	20.77	.....	90.90	.....	4,942	.....	4,658	.....	.....	.....	

*2-year average.

In computing the general summary at the end of Table 45 the "low values" used are 50 cents a bushel for corn, $2 for soybeans, $1 for wheat, $10 a ton for hay, $16 for acid phosphate, 2½ cents a pound for muriate of potash and 3 cents for nitrate of soda—these being approximately average prices for a few years preceding the European war. In the "high values" the prices for crops are doubled, acid phosphate is rated at $24 a ton, muriate of potash at 25 cents a pound and nitrate of soda at 5 cents.

At either valuation acid phosphate has been a very profitable investment; 500 pounds of this fertilizer, distributed over the three grain crops in the rotation, having increased the average yields by nearly 4 bushels of corn, 8½ bushels of wheat and 263 pounds of hay.

Muriate of potash added to the acid phosphate has produced a still further increase, this element of the fertilizer apparently having had a greater effect on all the crops except wheat than the phosphate, and at pre-war prices the net gain from the combination of the phosphate-potash mixture has been 50 percent greater than that of the phosphate alone, although the cost of the fertilizer has been considerably increased. When, however, the cost of the potash is based upon present prices it materially reduces the net gain.

Nitrate of soda has not increased the yields to a sufficient amount to more than barely justify its use at the low valuations, while under present conditions it causes a further reduction in net gain.

When the cost of manure is computed at merely the expense of moving it from the stable to the field the yard manure, which has been exposed to the weather for some months, runs a close race with acid phosphate in the net gain. When the manure has been used fresh from the stable the effect has been more than 50 percent greater than that of the yard manure. The reinforcement of the manure with acid phosphate has not yet produced a sufficient additional increase to justify the practice, and the same is true of the further reinforcement with ground limestone.

The fact should not be lost sight of that if manure were to be hauled several miles from the city to the farm, with possibly a charge for it in the city greater than the cost put upon it in the above computation, the financial outcome would be very different from that shown in these experiments.

THE POTATOES-WHEAT-CLOVER ROTATION

The plan of this experiment is shown in Table 47. The beginning of the test was delayed until 1913, in order to drain the land, and the work on Plots 11, 12 and 13 was not started until 1916. The outcome to the end of 1916 is shown in Table 50.

TABLE 47.—Plan of fertilizing in potatoes-wheat-clover rotation, Hamilton County Experiment Farm

Plot	On potatoes				On wheat			
	Acid phosphate	Muriate of potash	Nitrate of soda	Manure	Acid phosphate	Muriate of potash	Nitrate of soda	Manure
	Lb.	*Lb.*	*Lb.*	*Tons*	*Lb.*	*Lb.*	*Lb.*	*Tons*
1								
2	200				200			
3	200	50			200	50		
4								
5	200	50	50		200	50	50	
6	400	100	100		400	100	100	
7								
8				8				8
9	200			8	200			8
10								
11	200	50		8	200	50		8
12	200			8				
13								

The potato and clover yields in this experiment have been very irregular, the variations between consecutive unfertilized plots being sometimes greater than those supposedly due to treatment. The wheat yields are somewhat more consistent, but it will be necessary to carry the work through another complete rotation before attempting to draw any but the most general conclusions.

This is done in Table 48, which indicates a decided superiority of the manured plots over those receiving chemical fertilizers only.

TABLE 48.—Potatoes-wheat-clover rotation, Hamilton County Experiment Farm Total fertilizing materials, value of increase, cost of treatment and net gain per acre

Plot	Fertilizing materials				Value of increase		Cost of treatment		Net gain	
	Acid phosphate	Muriate potash	Nitrate soda	Manure	Low	High	Low	High	Low	High
	Lb.	*Lb.*	*Lb.*	*Tons*	*Doll.*	*Doll.*	*Doll.*	*Doll.*	*Doll.*	*Doll.*
2	400				5.00	10.00	3.20	4.80	1.80	5.20
3	400	100			19.17	38.34	5.70	29.80	13.47	8.94
5	400	100	100		19.70	39.40	8.70	34.80	11.60	4.60
6	800	200	200		31.36	62.73	17.40	69 60	13.96	—6.87
8				16	33.94	67.88	8.00	12.00	25.94	55.88
9	400			16	49.88	99.76	11.20	16.80	38.68	82.86
11	400	100		16						
12	200			8						

In considering the effect of manure in these experiments, however, it must be remembered that much larger quantities of the essential elements of fertility have been given to the manured plots than to those receiving chemicals only, as is shown by Table 49, which gives the estimated number of pounds of phosphorus, potassium and nitrogen contained in the total dressing for each of the two rotations.

TABLE 49.—Pounds per acre of fertilizing elements contained in different treatments Hamilton County Experiment Farm

Plot	Corn-soybeans-wheat-clover rotation			Potatoes-wheat-clover rotation		
	Phosphorus	Potassium	Nitrogen	Phosphorus	Potassium	Nitrogen
2	35	.....	.....	28	.....	.....
3	35	37	.....	28	41	.....
5	35	37	25	28	41	15.5
6	20	60	80	56	82	31.0
8	26	80	100	40	160	160.0
9	26	80	100	68	160	160.0
11	56	80	100	68	200	160.0
12	27	60	62	34	80	80.0

The table shows that the manured plots have received much larger quantities of nitrogen and potassium than those dressed with chemical fertilizers, and that it is the lower cost of these elements in manure than in chemicals which has given manure the advantage.

CONCLUSIONS

In these experiments the crops are responding promptly and very profitably to acid phosphate, and there is no doubt that a larger use of this fertilizer will be found generally profitable over the county.

Potassium is also producing a marked increase of crop, and commercial potash might be used with profit at normal prices. At present, however, the cost of this element is prohibitive. Stable manure, however, is a carrier of potash which is available to every farmer, and the outcome of these experiments supports the most careful saving and use of this source of fertility.

The larger part, if not all, of the nitrogen required for field crop production may be obtained through systematic growing of clover and soybeans, and very little encouragement is offered by these experiments to the purchase of commercial nitrogen.

COMPARISON OF VARIETIES

DEPARTMENT OF AGRONOMY

CORN

Eight varieties of corn have been tested for a period of 5 years, with the result that Clarage is first in yield; Darke County Mammoth, second; Cook's 75, third, and Orcutt's Reid, fourth.

TABLE 50.—Comparison of varieties of Cereals, Hamilton County Experiment Farm

Variety	Yield per acre					Average	
	1913	1914	1915	1916	1917	Grain	Stover or straw
Corn							
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Lb.*
Leaming	48.99	54.95	65.40	36.52	28.88	46.95	1,925
Clarage (local)	52.53	57.00	70.22	51.33	49.02	56.02	2,525
White Cap	51.42	43.49	61.84	30.86	32.86	44.09	1,769
Cook's 75	57.60	57.52	67.36	39.43	42.28	52.84	2,216
Reid (Orcutt)	52.13	61.79	62.35	38.47	46.26	52.20	2,603
Ohio 84	42 03	48 03	56.97	33.23	38.57	43.77	1,802
Clarage (Northern)	46.60	53.40	63.74	39.42	45.26	49.68	1,938
Leaming-Cuppy	51.84	67.68	.....	.....	.....	.....	2,227
Darke County Mammoth	53.18	61.26	65.88	43.71	49.02	54.61	2,437
Connor's Prolific	.....	.....	.....	45.12	49.64	.....	3,350
Oats							
Big Four	17.93	46.21	64.40	28 05	90.13	49.34	2,306
Silver Mine	21.51	42.88	65.23	32.31	87.45	49.88	2,357
Swedish Select	8.02	27.82	65.02	24.80	77.94	40.72	2,027
Ohio 7009	16.92	25.52	65.65	33.15	76.64	43.58	1,867
Ohio 6203	11.34	25.81	55.54	31.17	78.51	40.47	1,985
Ohio 6222	11.93	36.99	61.80	25.65	85.26	44.33	2,160
Wideawake	16.09	38.09	54.82	29.81	79.00	43.56	2,408
Iowa 103	.....	.....	.....	.....	78.24	.....	.....
Oderbrucker barley	8.96	14.38	29.38	17.71	50.70	24.23	1,729
Emmer	6.87	23.44	38.44	22.50	29.74	24.20	2,353
Soybeans							
Mongol	19.46	12.28	18.41	18.31	23.06	18.30	2,436
Ebony	16.51	12.25	22.41	17.58	21.73	18.09	2,378
Elton	10.34	11.61	21.19	6.53	20.45	14.02	2,012
Ohio 9100	15.35	11.34	15.22	9.64	14.72	13.25	1,862
Ohio 9016	15.13	*5.51	19.52	11.75	12.78	12.94	2,029
Ohio 7496	15.29	11.56	22.85	9.86	.....	14.89	2,493
Ohio 9035	19.30	14.17	14.68	21.14	19.79	17.82	2,251
Medium Green	13.90	7.92	16.30	8.20	14.00	12.06	2,090
Wilson	.....	.....	.....	.....	18.39	.....	.....
New Era cowpeas	5.33	7.08	1.00	2.67	7.50	4.72	2,767
Wheat							
Nigger	.....	27.41	25.89	26.97	22.59	25.71	3,011
Gladden	.....	22.35	28.62	29.34	47.92	32.06	3,029
Mediterranean	.....	22.14	25.29	27.38	38.92	28.43	3,510
Red Wave	.....	28.47	27.57	23.71	34.38	28.53	3,227
Turkey Red	.....	22.35	25.56	23.29	42.96	28.54	3,521
Ohio 8106	.....	26.57	26.05	24.80	.....	25.81	3,160
Portage	.....	28.85	25.23	25.34	25.58	26.25	2,629
Goens	.....	23.57	20.45	25.17	37.00	26.55	2,273
Velvet Chaff	.....	22.80	25.67	23.92	36.25	27.16	3,436
Ohio 9920	.....	.....	.....	30.88	32.33	.....	.....
Ohio 12127	.....	.....	.....	.....	40.41	.....	.....

*A poor stand.

OATS, BARLEY AND EMMER

Seven varieties of oats and, for comparison, Oderbrucker barley and emmer, have been tested for 5 seasons. The yields have varied widely with the season, 1917 giving by far the largest yields of the period. It is of interest to note that the 3 highest yielding varieties of 1917 were also the 3 highest in the 5-year average.

As a 5-year average the Silver Mine is the first in yield, Big Four, second, and Ohio 6222, third.

SOYBEANS AND COWPEAS

Eight varieties of soybeans and one of cowpeas have been tested 5 seasons. Averaging the 5 years' results, Mongol, Ebony and Ohio 9035, in the order named, are the 3 highest yielders. There is very little difference between these three. The New Era cowpeas have yielded less than one-third as much seed, on the average, as the average of all the different varieties of soybeans.

WHEAT

Nine varieties of wheat have been tested for 4 years. As an average of the 4 tests, Gladden leads in yield by over 3½ bushels per acre. The Turkey Red, Red Wave and Mediterranean follow in order, the three yielding very close together.

DATE OF SEEDING WHEAT

A date of seeding test was conducted in 1915, 1916 and 1917. The results in 1915 show September 22 as slightly in the lead, with October 13 a close competitor and October 6, third. In 1916 the seeding of September 29 led by a wide margin, the seedings made 1 and 2 weeks after, as well as 2 weeks earlier, showing a drop of nearly 9 bushels per acre. In 1917 wheat seeded October 16 led slightly, though seedings made from September 11 to October 16 yielded much the same. Even the seeding of October 30 was good. However, such very late seeding will evidently prove uncertain.

TABLE 51.—Date of seeding WHEAT, Hamilton County Experiment Farm

Date of seeding	1915	1916	1917
September 1	.....	8.00	.....
September 4	.....	.....	23.40
September 8	23.83	.....	.....
September 11	.....	6.67	31.14
September 15	20.17	14.67	.....
September 18	.....	.....	31.98
September 22	27.33	11.67	.....
September 25	.....	.....	29.96
September 29	16.67	23.00	.....
October 2	.....	.....	30.13
October 6	25.83	14.33	.....
October 9	.....	.....	31.14
October 13	26.17	.....	.....
October 14	.....	13.67	.....
October 16	.....	.....	32.82
October 20	.....	14.67	.....
October 23	.....	.....	26.09
October 27	4.67	.....	.....
October 30	.....	.....	28.11

BULLETIN

OF THE

Ohio Agricultural Experiment Station

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COUNTY EXPERIMENT FARMS IN OHIO

PART V

THE WASHINGTON COUNTY EXPERIMENT FARM

THIRD AND FOURTH ANNUAL REPORTS FOR THE YEARS 1916 AND 1917

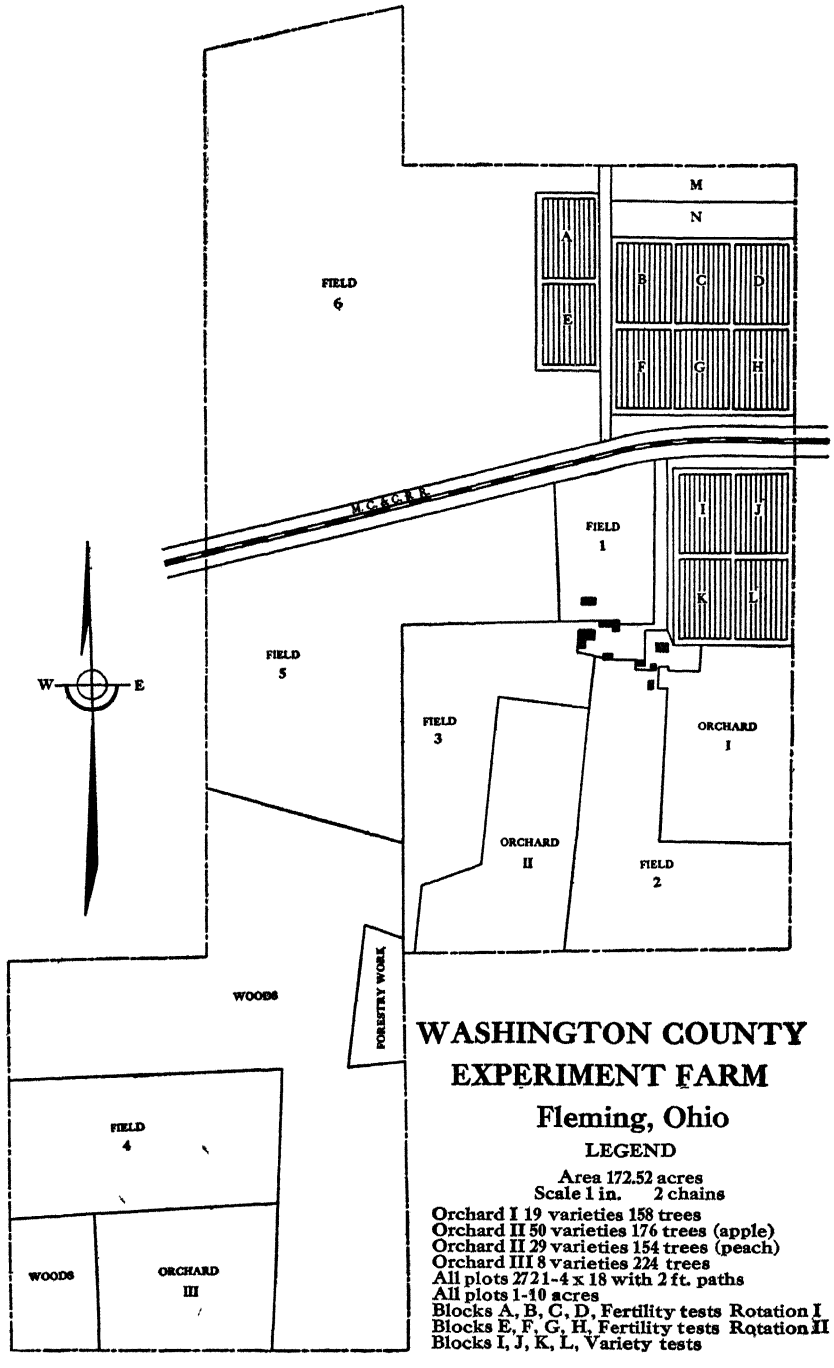
C. W. MONTGOMERY, CHIEF

ERNEST J. RIGGS, W. W. BROWNFIELD AND S. C. HARTMAN, SUPERINTENDENTS

C. B. HARVEY, FARM FOREMAN (FLEMING)
O. N. RILEY, TRUCK FOREMAN (MARIETTA)

PERSONNEL

In December, 1916, Ernest J. Riggs resigned as superintendent and was succeeded by W. W. Brownfield, who resigned July 1, 1917, and was succeeded by S. C. Hartman in September.



WASHINGTON COUNTY EXPERIMENT FARM

Fleming, Ohio

LEGEND

Area 172.52 acres
Scale 1 in. 2 chains

Orchard I 19 varieties 158 trees
Orchard II 50 varieties 176 trees (apple)
Orchard II 29 varieties 154 trees (peach)
Orchard III 8 varieties 224 trees
All plots 272 1-4 x 18 with 2 ft. paths
All plots 1-10 acres
Blocks A, B, C, D, Fertility tests Rotation I
Blocks E, F, G, H, Fertility tests Rotation II
Blocks I, J, K, L, Variety tests

WASHINGTON COUNTY STATISTICS

POPULATION (U. S. Census)

	1860	1870	1880	1890	1900	1910
Total		40,609	43,244	42,380	48,245	45,422
White		39,551	42,000	40,947	46,644	44,041
Negro		1,058	1,243	1,412	1,597	1,378
Foreign born		3,930	3,052	2,300	1,697	1,147
Rural					34,897	32,499
Urban					13,348	12,923

Population, 1910: Marietta 12,923; Belpre 1,249.

FARMS (U. S. Census)

	1880	1890	1900	1910
Approximate land area....acres.				403,200
Land in farms....acres.	347 316	376,349	374,694	368,307
Improved land in farms....acres.	252,603	268,117	280,691	257,759
Woodland in farms....acres.	86,677	108,232	94,003	68,304
Other unimproved land in farms....acres.	8,036			42,244
Total number of farms....number.	4,257	4,307	4,478	4,187
Area of average farm....acres.	81.6	87.4	83.7	88.0
Improved land per farm....acres.	59.3	62.3	62.7	61.6
Value of all property per farm....dollars.	7,391	2,712	2,639	3,530
Value of land and buildings per farm....dollars.	2,323	2,328	2,213	2,963
Value of land and buildings per acre....dollars.	40.72	26.64	26.44	33.67

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses	5,867	7,868	8,354	7,852	8,054	5,461
Cattle	17,460	20,041	20,165	20,506	16,783	14,299
Sheep	34,412	56,541	47,187	81,838	52,480	28,110
Hogs	17,318	17,047	15,716	11,743	9,081	5,061
Cattle equivalent* Total	28,500	35,268	34,809	37,716	30,993	23,077
Cattle equivalent* Per 1,000 acres			138	141	110	90

FARM CROPS, 10-year average production (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn....acres.	19,430	23,703	25,460	24,239	23,356	19,974
Bushels.	581,418	676,108	763,748	713,673	666,012	586,112
Bushels per acre.	30.0	28.5	29.5	29.4	28.5	29.4
Oats....acres.	7,475	9,011	10,263	7,956	7,385	7,327
Bushels.	78,484	168,257	172,170	157,076	137,373	136,132
Bushels per acre.	10.5	18.7	16.8	19.7	18.6	18.6
Wheat....acres.	25,299	21,678	24,553	30,839	30,675	19,117
Bushels.	278,632	171,720	264,922	347,100	396,150	233,910
Bushels per acre.	11.0	7.9	10.8	11.2	12.9	12.2
Rye....acres.	2 years 528	1,369	990	460	328	160
Bushels.	3,559	11,468	8,719	4,003	3,645	1,578
Bushels per acre.	6.7	8.4	8.8	8.7	11.1	9.9
Meadows....acres	14,710	18,259	20,104	27,199	33,844	34,497
Tons.	17,507	19,776	19,159	30,491	31,675	31,189
Tons per acre.	1.19	1.08	.96	1.12	.92	.90
Clover....acres.		2,104	2,739	5,567	2,701	1,203
Tons.		1,647	2,171	5,666	2,796	1,456
Tons per acre.		.78	.79	1.02	1.03	1.21
Potatoes....acres.		1,994	2,143	2,104	2,043	1,826
Bushels.		138,416	135,454	139,255	138,033	164,948
Bushels per acre.		69.4	63.2	68.0	67.6	90.3
Orchards....acres.		3 years 7,818	9,800	10,770	11,274	8,361
Apples....Bushels.		336,419	248,916	374,193	168,662	90,980

*Computing 10 sheep or hogs as equivalent to 1 horse or cow for manure production.

CROP AND LABOR STATISTICS OF THE WASHINGTON COUNTY EXPERIMENT FARMS FOR 1916

General Farm—Fleming

Area of farm, 172.52 acres
Area cultivated, 84.87 acres
Permanent pasture, 40 acres
Woodland, 34.52 acres
Waste, 3 acres
Roads (private), 2 acres
Roads (public), 3 acres
Miscellaneous, 5.13 acres

Crop	Number of plots	Total area	Total yield	Yield per acre
PLOT WORK		*Acres*	*Pounds*	
Corn	38	4.61	13,329	41.30 bu.
Wheat	30	3.0	2,418	13.43 bu.
Soybeans	9	.9	580	10.74 bu.
Cowpeas	1	.1	10	1.66 bu.
Hay: timothy and clover	30	3.37	12,270	1.8 tons
soybean	20	2.0	7,391	1.8 tons
Pasture plots	20	1.96	not harvested	
	148	15.94		
FIELD WORK				
Corn		7.0	282.06 bu.	40.29 bu.
Oats		.6	12.0 bu.	20.0 bu.
Canada peas and oats		1.25	28.0 bu.	22.4 bu.
Wheat		16.50	198.5 bu.	12.0 bu.
Hay: timothy and clover		9.0	28.000 lb.	1.56 tons
soybean		8.0	20,000 lb.	1.25 tons
oat and pea		1.25	3.000 lb.	1.2 tons
Apples		10.0	389 bbl.	38.9 bbl.
Unharvested area:				
Orchard		7.0		
Rape		2.33		
Sweet clover		2.0		
Alfalfa		4 (seeded '16)		
Total crop acres		84.87		
Less plot acres		15.94		
Total field acres		68.93		

	Corn *Bu.*	Soybeans *Bu.*	Wheat *Bu.*	Soybean hay *Tons*
Highest yielding plots per acre	98.00	13.67	23.33	2.35
Lowest yielding plots per acre	40.57	8.33	2.83	1.42

Number work horses used on Washington County Experiment Farm in 1916 3
Number crop acres per work horse 28.29
Number man hours for the year (March 1, 1916 to February 28, 1917, inclusive) 5,989
Number horse hours for the year (March 1, 1916 to February 28, 1917, inclusive) 1,636

CROP AND LABOR STATISTICS OF THE WASHINGTON COUNTY EXPERIMENT FARMS FOR 1916

Truck Farm—Marietta

Area of farm, 10 acres
Area cultivated, 9.25 acres

Building site, etc., .75 acre

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK				
Cabbage	32	0.8	14,284 lbs.	8.9 tons
Cucumbers	32	.8	9,309 lbs.	2.82 tons
Sweet corn	32	.8	5,186 lbs.	3.24 tons
Tomatoes	32	.8	9,563 lbs.	5.98 tons
	128	3.2	.....	.....
FIELD WORK				
Cabbage	.....	1.56	49,431 lbs.	15.86 tons
Sweet corn	.....	2.84	9,600 lbs.	1.64 tons
Peppers	.....	.08	13.5 doz.	168¾ doz.
Tomatoes	.....	.5	2,474.51 lbs.	2.47 tons
Cowpeas	.....	1.07	6,000 lbs.	2.8 tons
Total crop acres	.....	9.25	.....	.....
Less plot acres	.....	3.25	.....	.....
Total field acres	.....	6.05	.....	.....

	Cabbage *Tons*	Cucumbers *Tons*	Sweet corn *Tons*	Tomatoes *Tons*
Highest yielding plots per acre	13.36	11.36	3.8	8.07
Lowest yielding plots per acre	3.6	1.46	2.8	4.66

Number work horses used on Washington County Experiment Truck Farm in 1916 2
Number crop acres per work horse 4.18
Number man hours for the year (March 1, 1916 to February 28, 1917, inclusive) 3,200.5
Number horse hours for the year (March 1, 1916 to February 28, 1917, inclusive) 1,987

CROP AND LABOR STATISTICS OF THE WASHINGTON COUNTY EXPERIMENT FARM FOR 1917

General Farm—Fleming

Area in farm, 172.52 acres
Area in farmstead, 5.13 acres
Area cultivated, 93.76 acres
Permanent pasture, 34.98 acres
Woodlot, 31 acres
Forestry, 1.35 acres
Public roads, 3 acres
Farm roads, 3.3 acres

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK		*Acres*	*Pounds*	
Corn	30	3	11,833	56.35 bu.
Wheat	30	3	2,636	14.65 bu.
Soybeans	5	.5	288	9.6 bu.
Hay: clover	30	3.38	12,567	1.86 tons
soybean	23	2.3	6,245	1.36 tons
cowpea	2	.2	670	1.68 tons
Pasture	20	1.96	not harvested	
Total	140	14.34		
FIELD WORK				
Corn		8.4	25,130 lbs.	42.74 bu.
Wheat		17.5	15,840 lbs.	15.1 bu.
Rye		.7	504 lbs.	12.86 bu.
Hay; clover		21.	62,000 lbs.	1.48 tons
alfalfa		3.	2,500 lbs.	.42 ton
soybean		1.4	,640 lbs.	.94 ton
Apples		13.	60 bbl.	4.62 tons
Unharvested area:				
Alfalfa		1.42	winter-killed and reseeded	
Sweet clover		.6		
Soybeans		1.5	disked in (in orchard)	
Truck and curiosity patch		1.		
Forage		3.		
Uncropped and fallow		1.4		
Orchard		5.5		
Total field acres		79.42		
Plus plot acres		14.34		
Total crop acres		93.76		

	Corn	Wheat	Clover hay	Soybean hay
	Bu.	*Bu.*	*Tons*	*Tons*
Highest yielding plots per acre	75	26.66	3.08	1.75
Lowest yielding plots per acre	34.85	3.33	1.05	.85

Number work horses used on Washington County Experiment Farm in 1917.....4
Number crop acres per work horse.....23.44
Number man hours per year (March 1, 1917 to February 28, 1918 inclusive).....6,805.
Number horse hours per year (March 1, 1917 to February 28, 1918 inclusive).....3,040.

CROP AND LABOR STATISTICS OF THE WASHINGTON COUNTY EXPERIMENT FARMS FOR 1917

Truck Farm—Marietta

Area of farm, 9.8 acres
Rented field, 3 acres
Area cultivated, 10.7 acres

Area in farmstead, .7 acre
Public roads, .25 acre
Farm roads and paths, 1.3 acres

Crop	Number of plots	Total area	Total yield	Yield per acre
PLOT WORK		*Acres*		
Cabbage	32	.8	14,760 lb.	9.23 tons
Cucumbers	32	.8	758 lb.	4.74 tons
Sweet corn	32	.8	5,840 lb.	3.65 tons
Tomatoes	32	.8	10,300 lb.	6.44 tons
Totals	128	3.2		
Cover crops:				
Rye	53	1.325		
Cowpeas	75	1.875		
Totals	128	3.2		
FIELD WORK				
Corn (rented field)		3.0	4,480 lb.	21.33 bu.*
Cabbage		2.0	76,854 lb.	19.21 bu.
Tomatoes		.5	1,985 lb.	1.99 tons
Potatoes		1.5	13,680 lb.	152.0 bu.
Turnips		.5	369 doz.	738.0 doz.
Total field acres		7.5		
Succession crops:				
Beans		.5	570 lb.	19.0 bu.
Cover crops:				
Rye		3.5		
Cowpeas		2.5		
Plots and cover crops		6.4		
Total crop areas		20.4		

	Cabbage	Cucumbers	Sweet corn	Tomatoes
	Tons	*Tons*	*Tons*	*Tons*
Highest yielding plots per acre	11.64	11.16	4.8	9.06
Lowest yielding plots per acre	4.58	.9	2.46	.7

Number work horses used on Washington County Experiment Truck Farm in 1916 2
Number crop acres per work horse 10.2
Number man hours per year (March 1, 1917 to February 28, 1918 inclusive) 5,293
Number horse hours per year (March 1, 1917 to February 28, 1918 inclusive) 2,347

*Immature.

RECEIPTS AND EXPENDITURES

Of the Washington County Experiment Farms

for the year ending February 28, 1917

General Farm—Fleming:

RECEIPTS

From county treasury		$761.52
From farm sales:		
Livestock and livestock products—cattle $177.59; wool $261.30	438.98	
Grain and beans—wheat $240.44; rye $12.90; corn $2.50; soybeans $5.50	261.34	
Fruit—apples	2,099.04	
Containers	44.84	
Spray pump and truck	25.00	
Horse feed and fodder	40.00	
		$2,909.11
From oil rental		85.00
Total receipts		$3,588.53

EXPENDITURES

For labor			$1,769.16
For current expense—seeds, etc. $165.96; fertilizer, lime, etc. $205.55; spray materials $72.76; blacksmithing and repairs $21.90; fuel and light $13.06; painting $9.03; power maintenance $4.98; miscellaneous hardware $9.74; containers $344.38; telephone and telegraph $33.52; transportation $104.11; postage $7.25; office supplies $1; taxes $64.39			1,057.63
For machinery and tools			253.77
For permanent improvement:			
Buildings	$203.53		
Building material and construction	36.89		
		$240.42	
Fences		116.62	
Water supply		53.98	
			411.02
For livestock:			
Maintenance—feeds $91.65; veterinary, medicine, etc. $5.30			96.95
Total expenditures			$3,588.53

Truck Farm—Marietta:

RECEIPTS

From county treasury	$ 739.03
From farm sales:	
Truck crops—tomatoes $303.19; cabbage $889.53; sweet corn $227.14; cucumbers $185.52; miscellaneous $1.70	1,607.08
	$2,346.11

EXPENDITURES

For labor		$1,098.16
For current expense—seeds, etc. $25.33; fertilizer, lime, etc. $134.70; spray materials $29.46; blacksmithing and repairs $19.15; fuel and light $16.22; painting $5.30; containers $169.10; telephone and telegraph $18; transportation $76.06; taxes $65; miscellaneous $16.40		574.72
For machinery and tools		143.97
For permanent improvement:		
Building material	$ 5.10	
Plumbing	190.81	
	$195.91	
Water supply	34.54	
Greenhouse additions	177.28	
		407.73
For livestock maintenance—feeds $118.03; veterinary, medicine, etc. $3.50		121.53
Expenditures		$2,346.11

RECEIPTS AND EXPENDITURES

Of the Washington County Experiment Farms for the year ending February 28, 1918

General Farm—Fleming:

RECEIPTS

From county:		
Maintenance fund distribution county treasury		$1,380.72
From farm sales:		
Livestock—lambs $150.36	$150.36	
Livestock products—wool $431.55	431.55	
Crops—soybeans $22.25; wheat $190.47; straw $21; apples $560.24	793.96	
Sundries—feed $65; seeds $210.18; miscellaneous $3; royalties $106.25	384.43	
		1,760.30
From O. A. E. S.—forest trees furnished		33.50
Total receipts		$3,174.52

EXPENDITURES

For labor	$1,539.48
For current expenses—seeds $91.18; feeds $68; fertilizer, etc. $318.75; spray material $28.94; containers $165.53; binding material $14.04; threshing, etc. $49.78; sheep shearing $10.50; veterinary services $6.90; implement repairs $7.67; engine maintenance $7.74; horse shoeing and equipment $50.95; building renewal and repair $61.31; water system maintenance $16.61; communication $43.83; transportation $3.25; publicity $14; literature $4; oil leases $1.14; miscellaneous hardware $3.53	967.65
For permanent improvements: Fence material $9; building material $174; concrete material $5; water system material and construction $67.75; permanent planting $38.05	293.80
For machinery and tools: Farm—implements $60.20; orchard equipment $13.84; gas engine $74.50	148.54
For livestock—ram	53.46
Total expenditures	$3,002.93
Balance in treasury February 28, 1918	148.74
In hands of superintendent for payment of small bills	22.85
	$3,174.52

Truck Farm—Marietta:

RECEIPTS

From county treasury	$ 580.52
From farm sales:	
Truck crops—tomatoes $348.59; cabbage $935.33; sweet corn $110.35; cucumbers $77.67; potatoes $202.20; cowpea hay $10; seeds and plants $73.85; turnips $149.26; navy beans $11.85; miscellaneous truck $10.64	1,929.74
From O. A. E. S. (cabbage seeds)	100.00
Total receipts	$2,610.26

EXPENDITURES

For labor	$1,203.50
For current expenses—seeds $209.80; fertilizer and lime, etc. $88.90; spray materials $19.80; horse shoeing, etc. $51.95; fuel and lights $10.20; transportation $10.95; veterinary services $9.35; feeds $219.99; binding material $6.70; marketing $6.20; rent of corn land $35; miscellaneous hardware $4.31	1,009.73
For machinery and tools	89.45
For permanent improvements—building material and maintenance $56.25; cement $27.50; drainage material $17.33; ornamental plants $5	106.08
For livestock—livestock purchase	176.50
Total expenditures	$2,585.26
In hands of superintendent for payment of small bills	25.00
	$2,610.26

INVENTORY AND CLASSIFICATION OF OPERATING EQUIPMENT

Washington County Experiment Farms, March 1, 1917

General Farm—Fleming:

Land—including buildings (original cost)		$7,762.50
Operating equipment:		
Livestock—4 horses $475; 92 sheep $400;	$875.00	
Machinery and tools—horse equipment $64.25; orchard equipment $104; general farm machinery $556.60; small tools $69.25	794.10	
Feed and produce—hay $144; straw $63; corn $300	507.00	
Fertilizer	45.00	
Supplies—material for cistern	19.00	
Total operating equipment		$2,240.10
Total investment inclusive of permanent improvements		$10,002.60

Truck Farm—Marietta:

Land—including buildings (original cost)		$8,000.00
Operating equipment:		
Livestock—2 horses	$375.00	
Machinery and tools—horse equipment $54.50; general farm tools $319.25	373.75	
Total operating equipment		748.75
Total investment exclusive of permanent improvements		$8,748.75

COST OF PERMANENT IMPROVEMENTS

Since establishment of farm in 1914

General Farm—Fleming:

Item	Year	Cost
*Barn (remodeled)	1914-15	$700.00
*Corn crib and wagon shed	1914-15	250.00
*Wagon scale	1914-15	150.00
Wire fence (128 rods)	1914-15	96.91
Tile drains (985½ rods)	1914-15	705.62
Permanent planting:		
Forestry (4,700 trees)	1915-17	75.50
Orchard (188 apple and 151 peach)	1914-15	64.71
Water supply system	1917	178.76
Total permanent improvement		$2,221.50

*Estimated.

FINANCIAL SUMMARY

Inventory of Permanent Investment Costs and Operating Equipment
March 1, 1918

General Farm—Fleming:

Land—original cost including buildings	$7,762.50	
Permanent improvements to date	2,221.50	
Total permanent investment		$9,984.00
Operating equipment:		
Livestock—5 horses and colt $435; 63 sheep, 28 lambs $1,040	$1,475.00	
Machinery, tools and harness	880.75	
Crops, feeds, etc.—corn $500; wheat $74; soybean hay $50; hay $300	924.00	
Seeds—pasture mixture $10; alfalfa $9; timothy $4; corn $10; soybeans $20	53.00	
Fertilizer and limestone	185.00	
Building material—lumber $150; gravel $5	155.00	
Sundries—fuel $3; spray material $4.25; barrels $15	22.25	
Total operating equipment		3,695.00
Total investment		$13,679.00

Truck Farm—Marietta:

Land—including buildings (original cost)	$8,000.00	
Permanent improvements to date	810.25	
Total permanent investment		$8,810.25
Operating equipment:		
Livestock—2 horses	$375.00	
Machinery, tools and harness $319.25; horse equipment $54.50	373.75	
Total operating equipment		748.75
Total investment		$9,559.00

AGRICULTURAL CONDITIONS OF WASHINGTON COUNTY

W. W. BROWNFIELD

The unglaciated portion of southeastern Ohio comprises approximately one-fourth of the total area of the state. The topography of this region varies from gently rolling to quite rough and broken. A considerable part of it lends itself readily to the operations of crop rotation, but there yet remains a large acreage too rough and hilly to be of value other than for pasture and forestry purposes. In fact, it would even seem that some land which has been cleared might have served a better purpose had it been left in the original forest.

Washington County, with 634 square miles, or 405,760 acres, is fairly typical of southeastern Ohio. As might naturally be expected, a number of different types are represented in its soils.

The greater part of the soils of the county belong to the Meigs series, made up of undifferentiated DeKalb and Upshur soils, the topography of the county being too hilly to indicate the areas of the two on a soil map. The soils of the series consist of DeKalb silt loam, DeKalb sandy loam, DeKalb stony loam, Upshur clay, and the various gradations between.

The DeKalb silt loam comprises by far the most extensive area in the county. It is usually not a very deep soil and is generally grayish yellow in color. It is not what might properly be termed a strong soil. Chemical analysis shows it to have a low content of phosphorus—frequently less than 1,000 pounds in 2,000,000 pounds of soil (6⅔ inches deep over an acre), and it is usually deficient in nitrogen.

The average yields of crops for the county are not large, and yet soils of this character are capable of being made productive by proper care. By this is meant the use of liberal amounts of acid phosphate, the careful saving and use of stable manure, the use of winter cover crops, crop rotation with one or more legumes in a three, four or five year rotation, and good tillage. Most of this soil is acid in varying degrees and responds to applications of lime or limestone.

For the growing of hay, potatoes, wheat, buckwheat, or orcharding, these soils are well adapted, providing manure and acid phosphate are supplied in adequate amounts. DeKalb soils may be quite good or exceedingly poor, depending upon the treatment given.

Upshur clay is chocolate brown or reddish brown in color and occurs for the most part on the most elevated points only. Much

of it, for this reason, is untillable, but is well suited to the production of pasture grasses. Where tilling is practicable good crops may be grown. There are fields of this type of soil in the county which are growing fine crops of alfalfa.

Along the streams of the county Dunkirk sand occurs, tending toward loam in places, with considerable areas of gravel admixture.

Many instances also occur in which annual overflows year after year have built up rather large areas of a heavier type of soil from deposits of material of the Meigs series eroded from the hillsides.

Field meeting, Washington County Experiment Farm

THE FUTURE OF THE COUNTY

Two steam railroads and one electric line traverse the county, and it has a frontage of about 55 miles on the Ohio River, and yet much of the county is quite distant from any means of public transportation. The abandonment of the M. C. & C. railroad has imposed a great hardship upon the people of the west end of the county. The county, while one of the earliest settled in the state, is particularly deficient in improved highways. Permanent roads are as yet mere visions of the more or less distant future.

In view of this brief statement as to contour, soil types, shipping facilities and condition of roads, it is not difficult to decide upon the logical lines of farming adapted to the county, viz., orcharding, livestock farming and trucking.

The growing of apples and truck crops has already assumed a prominent place in the agriculture of the county and the production of better livestock and its products is receiving more careful attention than formerly.

In line with these different types of farming, a great many problems arise as to proper methods and economic procedure.

Livestock farming involves questions of most suitable crops, best varieties of different crops, methods of handling, many problems of soil fertility, economic use of fertilizers in connection with the conservation and use of all manure produced, and pasture improvement, as well as feeding and management of the stock.

Pasture improvement is one of the crying needs of the county and upon its successful working out will depend to a large extent the increase in importance of livestock and general farming. Many acres of badly eroded hillsides are at present producing practically nothing of value, which should have the washing stopped and be made to produce profitable pasture. In some cases sweet clover is used to good advantage, but it is not a sure catch, owing to the generally acid conditions of the soil. One of the plants which would seem to give greatest promise for this purpose is Japanese clover. It is small in habit of growth, an annual, producing seed from axils of the leaves, and is not very particular as to where it locates. In addition to being good for seeding in washing places, it would seem to be useful for pasture seeding mixtures. There is much yet to be worked out in the matter of pasture regeneration.

Numerous apple orchards adorn the elevations in many parts of the county, and in the management of these for profit many perplexing problems arise. Within the past few years the business of apple growing in southeastern Ohio has been rescued from a lingering death and stimulated to a renewed and active life through orchard work done by the Horticultural Department of the Ohio Experiment Station.

Reports of previous work have been made elsewhere and it is sufficient to remark that experimentation is still in progress and gives promise of further increased benefit to orchardists.

The business of market gardening is of transcendent importance, the production and returns of 1916 showing a large increase over previous years. On the sandy loam and gravelly soils of the trucking region the proposition of first importance is soil fertility and proper use of fertilizers.

EXPERIMENTS IN THE MAINTENANCE OF SOIL FERTILITY

Because of the limited area of land suited to plot experiments the study on this farm of the use of fertilizers and manures on field crops is limited to a single experiment on crops grown in the 4-year rotation of corn, soybeans, wheat and clover, and since the livestock on this farm will be chiefly sheep a special study of sheep manure is planned.

Table 52 shows the distribution of fertilizers and manure on the different crops and Table 53 is arranged to exhibit more clearly the plan of the experiment. It will be seen that Plots 2, 3, 5 and 6 in this experiment receive the same treatment as do the correspondingly numbered plots in similar experiments on the other county experiment farms, thus giving opportunity for comparison of this system of crop rotation and treatment under different conditions of soil and climate.

TABLE 52.—Plan of fertilizing, Washington County Experiment Farm

Pounds of fertilizing materials per acre for each crop

Plot	Acid phosphate	Muriate potash	Nitrate soda	Limestone	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda
	On corn				On soybeans			On wheat		
1										
2	200				100			200		
3	200	50			100	20		200	20	
4										
5	200	50	50		100	20	30	200	20	80
6	200	50	50	1 ton	100	20	30	200	20	80
7										
8	125	90	200					125	90	200
9	375	90	300					375	90	300
10										
11										
12	Sheep manure, 2 T							Sheep manure, 2 T.		
13	Sheep manure, 2 T.; acid phos., 250 lb.							Sheep manure, 2 T.; acid phos., 250 lb.		
14										
15	Sheep manure, 2 T.; acid phos., 400 lb.							Sheep manure, 2 T.; acid phos., 400 lb.		
16	Sheep manure, 4 T.; acid phos., 400 lb.							Acid phosphate, 400 lb.		
17										
18	Sheep manure, 4 T.; acid phos., 400 lb.			1 ton				Acid phosphate, 400 lb.		
19	Horse manure, 4 T., acid phos., 400 lb.							Horse manure 4 T.; acid phos., 400 lb.		
20										

The complete fertilizer, as used on Plots 5 and 6, contains approximately 4 percent of ammonia, 11 percent phosphoric acid and 6 percent of potash, as actually made up and used. No commercial fertilizer, however, is made up exclusively of such high grade materials as 16-percent acid phosphate, nitrate of soda and

muriate of potash. If these materials are used at all they are diluted with some "filler," which may as well be the earth of the field on which they are to be used as anything else. The addition of 250 pounds of dirt to these mixtures would give 1,000 pounds of a 3-8-4½ formula, which would contain precisely the same quantities of fertilizing constituents as the 750 pounds actually used.

On Plot 8 the acid phosphate is reduced to one-half the standard application, while the nitrate of soda and muriate of potash are increased. This gives a fertilizer carrying approximately the same quantity of phosphoric acid as the 4 tons of sheep manure used on Plot 12 but still with less ammonia and potash. On Plot 9 a further increase of nitrate of soda is made and the quantity of phosphoric acid is raised to 120 pounds, to compare with the 4 tons of manure reinforced with acid phosphate used on Plot 13. On Plots 15 to 19 the manure is reinforced with still larger quantities of acid phosphate, for the purpose of bringing the ammonia-phosphoric acid-potash ratio to a point more nearly in line with those familiar in commercial fertilizers, although the difference is still large. Estimating manure at 75 percent water, the 4 tons of manure would contain one ton of dry substance which, reinforced with 800 pounds of acid phosphate, would give a 5-6-3½ formula on these plots.

TABLE 53—.Plan of fertilizing Washington County Experiment Farm. Total fertilizers or manure per acre on entire rotation, with pounds of fertilizing constituents contained.

Plot No.	Total	Pounds of fertilizing constituents			Relative composition
		Ammonia	Phosphoric acid	Potash	
	Lb.				*Percent*
2	500	.....	80	.....	.....
3	590	.....	80	45	.....
5	750	30	80	45	3-8-4½
6	750	30	80	45	3-8-4½
8	830	76	40	90	7½-4-9
9	1,530	114	120	90	11-12-9
12	8,000	140	40	96	14-4-9
13	8,500	140	120	96	9-8-6
15	8,800	140	168	96	5-6-3½
16	8,800	140	168	96	5-6-3½
18	8,800	140	168	96	5-6-3½
19	16,800	136	168	122	3-4-2½

Corn has been grown according to plan in this experiment in 1915 on Blocks C and G, in 1916 on B and F, and in 1917 on A and E, and the results are given in Table 58. Soybeans were grown without fertilizing in 1915 on Blocks D and H and were made into hay, as were also the fertilized crops of 1916 and 1917. The crop of 1915 is not included in the average. Wheat was grown in 1916 on Blocks D and H and in 1917 on Blocks B and G according to plan, but as corn had not been grown on Blocks D and H the wheat has not yet received the full effect of the treatment.

TABLE 54, Part I.—Fertilizers, lime and manure on CORN grown in rotation with soybeans, wheat and clover, Washington County Experiment Farm. Yield and increase per acre

Plot No.	Treatment per acre on corn	1915 Yield Grain Bu.	1915 Yield Stover Lb.	1915 Increase Grain Bu.	1915 Increase Stover Lb.	1916 Yield Grain Bu.	1916 Yield Stover Lb.	1916 Increase Grain Bu.	1916 Increase Stover Lb.	Plot No.
		Block C				Block B				
1	None	36.14	3,390	.....	.....	53.57	2,740	.....	.....	1
2	Acid phosphate, 200 lb	41.43	4,250	—2.54	473	60.00	3,080	8.48	273	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	52.64	4,645	.83	482	57.14	3,030	7.66	157	3
4	None	59.64	4,550	.....	.....	47.43	2,940	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	62.64	4,605	5.07	267	48.29	2,830	1.77	—83	5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; ground limestone, 2,000 lb.	64.64	4,670	9.14	543	51.71	3,200	6.09	313	6
7	None	53.43	3,915	.....	.....	44.71	2,860	.....	.....	7
8	Acid phos., 125 lb.; mur. potash, 90 lb.; nit. soda, 200 lb.	67.86	4,325	18.24	425	57.00	3,270	13.67	517	8
9	Acid phos., 375 lb.; mur. potash, 90 lb.; nit. soda, 300 lb.	67.79	4,670	21.98	785	62.14	3,660	20.19	1,013	9
10	None	42.00	3 870	.....	.....	40.57	2,540	.....	.....	10
	Average unfertilized yield	47.80	3,931	.....	.....	46.57	2,770	.....	.....	
		Block G				Block F				
11	None	46.00	4,600	.....	.....	50.86	3,395	.....	.....	11
12	Sheep manure, 2 tons	65.43	4,300	22.86	—167	65.50	3,965	15.55	662	12
13	Sheep manurs, 2 tons; acid phosphate, 250 lb	45.71	4,600	6.57	267	65.79	4,020	16.74	808	13
14	None	35.71	4,200	.....	.....	48.14	3,120	.....	.....	14
15	Sheep manure, 2 tons; acid phosphate, 400 lb.	31.71	4,600	—2.10	600	57.71	3,640	8.31	492	15
16	Sheep manure, 4 tons; acid phosphate, 400 lb	32.29	4,400	.39	600	68.64	4,390	17.97	1,213	16
17	None	30.00	3,600	.....	.....	51.93	3,205	.....	.....	17
18	Sheep manure, 4 tons; acid phos. 400 lb., ground limesnone, 2,000 lb	42 86	4,150	10.19	283	67.29	3,720	16.50	587	18
19	Horse manure, 4 tons; acid phosphate, 400 lb.	29.86	4,800	—5.47	667	58.50	3,410	8.36	348	19
20	None	38.00	4,400	.....	.....	48.50	2 990	.....	.....	20
	Average unfertilized yield	37.43	4 200	.....	.....	49.86	3 177	.....	.....	

TABLE 54, Part II.—Fertilizers, lime and manure on CORN grown in rotation with soybeans, wheat and clover, Washington County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre on corn	1917				3-year average				Plot
		Yield		Increase		Yield		Increase		
		Grain *Bu.*	Stover *Lb.*	Grain *Bu.*	Stover *Lb.*	Grain *Bu.*	Stover *Lb.*	Grain *Bu.*	Stover *Lb.*	
		Block A								
1	None	42.00	2,160	.....	.....	43.90	2,763	.....	.....	1
2	Acid phosphate, 200 lb	47.71	2,700	3.95	237	49.71	3,343	3.30	328	2
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	43.00	2,590	—2.53	—177	50.93	3,422	1.99	154	3
4	None	47.29	3,070	.....	.....	51.45	3,520	.....	.....	4
5	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.	58.57	3,740	9.95	710	56.50	3,725	5.60	298	5
6	Acid phos., 200 lb.; mur. potash, 50 lb.; nitrate soda, 50 lb.; ground limestone, 2,000 lb.	59.43	3,250	9.47	260	58.59	3,707	8.23	372	6
7	None	51.29	2,950	.....	.....	49.81	3,242	.....	.....	7
8	Acid phos., 125 lb.; mur. potash, 90 lb.; nitrate soda, 200 lb.	44.86	2,340	— .62	—253	56.57	3,312	10.43	230	8
9	Acid phos., 375 lb.; mur. potash, 90 lb.; nitrate soda, 300 lb.	35.57	1,970	—4.10	—267	55.17	3,433	12.69	510	9
10	None	33.86	1,880	.....	.....	38.81	2,763	.....	.....	10
	Average unfertilized yield	43.61	2,515	.....	.....	45.99	3,072	.....	.....	
		Block E								
11	None	64.29	3,920	.....	.....	53.72	3,972	.....	.....	11
12	Sheep manure, 2 tons	63.71	4,300	.52	247	64.88	4,198	12.98	247	12
13	Sheep manure, 2 tons; acid phosphate, 250 lb.	57.57	4,030	—4.53	—217	56.36	4,217	6.26	286	13
14	None	61.00	4,410	.....	.....	48.28	3,910	.....	.....	14
15	Sheep manure, 2 tons; acid phosphate, 400 lb.	68.29	4,380	8.15	110	52.57	4,207	4.79	401	15
16	Sheep manure, 4 tons; acid phosphate, 400 lb.	57.00	3,160	—2.29	—970	52.64	3,983	5.36	281	16
17	None	58.43	3,990	.....	.....	46.79	3,598	.....	.....	17
18	Sheep manure, 4 tons; acid phosphate, 400 lb.; ground limestone, 2,000 lb.	72.86	4,810	12.81	767	61.00	4,227	13.17	546	18
19	Horse manure, 4 tons; acid phosphate, 400 lb	66.14	4,580	4.47	483	51.50	4,263	2.62	499	19
20	None	63.29	4,150	.....	.....	49.93	3,847	.....	.....	20
	Average unfertilized yield	61.74	4,267	.....	.....	49.68	3,881	.....	.....	

TABLE 55.—Fertilizers, lime and manure on WHEAT grown in rotation with corn, soybeans and clover, Washington County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre on wheat	1916 Yield Grain Bu.	1916 Yield Straw Lb.	1916 Increase Grain Bu.	1916 Increase Straw Lb.	1917 Yield Grain Bu.	1917 Yield Straw Lb.	1917 Increase Grain Bu.	1917 Increase Straw Lb.	Average Yield Grain Bu.	Average Yield Straw Lb.	Average Increase Grain Bu.	Average Increase Straw Lb.	Plot
		Block C				Block B				2-year average				
1	None	6.50	360			4.67	620			5.58	490			1
2	Acid phosphate, 200 lb.	5.33	780	.05	450	8.83	670	2.33	— 73	7.08	725	1.19	188	2
3	Acid phosphate, 200 lb.; muriate potash, 20 lb.	5.42	585	1.37	285	12.00	1,180	3.66	313	8.71	882	2.51	299	3
4	None	2.83	270			10.17	990			6.50	630			4
5	Acid phos., 200 lb.; mur. pot., 20 lb.; nitrate soda, 80 lb.	11.83	1,290	7.53	822	16.17	1,630	6.67	700	14.00	1,460	7.10	761	5
6	Acid phos., 200 lb.; mur. pot., 20 lb., nitrate soda, 80 lb.	12.33	1,210	6.55	543	18.33	2,100	9.49	1,230	15.33	1,655	8.02	886	6
7	None	7.25	865			8.17	810			7.71	837			7
8	Acid phos., 125 lb.; mur. pot., 90 lb.; nitrate soda, 200 lb.	18.00	1,720	9.89	673	16.50	1,710	9.94	970	17.25	1,715	9.91	821	8
9	Acid phos., 375 lb.; mur. pot., 90 lb.; nitrate soda, 300 lb.	18.83	1,720	9.86	492	16.83	1,790	11.89	1,120	17.83	1,755	10.87	806	9
10	None	9.83	1,410			3.33	600			6.58	1,005			10
	Average unfertilized yield	6.50	726			6.58	755			6.59	740			
		Block H				Block G				2-year average				
11	None	11.58	1,105			10.17	1,090			10.87	1,097			11
12	Sheep manure, 2 tons	14.00	1,360	4.64	372	12.67	840	2.45	—213	13.33	1,100	3.54	79	12
13	Sheep manure, 2 tons; acid phosphate, 250 lb.	17.58	1,745	10.44	873	13.50	1,290	3.22	273	15.54	1,517	6.83	573	13
14	None	4.92	755			10.33	980			7.62	867			14
15	Sheep manure, 2 tons, acid phosphate, 400 lb.	15.67	1,160	8.95	320	13.50	1,290	3.84	403	14.58	1,225	6.39	361	15
16	Acid phosphate, 400 lb. (manured on corn)	12.67	2,040	4.14	1,115	12.00	980	3.00	187	12.33	1,510	3.57	651	16
17	None	10.33	1,010			8.33	700			9.33	855			17
18	Acid phosphate, 400 lb. (manure and limestone on corn)	17.67	1,540	7.23	447	16.00	1,040	7.67	273	16.83	1,290	7.45	360	18
19	Horse manure, 4 tons; acid phosphate, 400 lb.	16.33	1,520	5.77	343	16.83	1,390	8.50	557	16.58	1,455	7.13	450	19
20	None	10.67	1,260			8.33	900			9.50	1,080			20
	Average unfertilized yield	9.37	1,032			9.29	917			9.33	974			

TABLE 56—.Fertilizers, lime and manure on SOYBEANS and CLOVER grown in rotation with corn and wheat, Washington County Experiment Farm. Yield and increase per acre.

Plot No.	Treatment per acre on soybeans	Soybeans						Clover		Plot No.
		1916		1917		2-year average		1917		
		Yield Lb.	Increase Lb.	Yield Lb.	Increase Lb.	Yield Lb.	Increase Lb.	Yield Lb.	Increase Lb.	
		Block C		Block B				Block D		
1	None	3,350		2,700		3,025		2,293		1
2	Acid phosphate, 100 lb	3,950	500	3,100	567	3,525	533	2,924	776	2
3	Acid phosphate, 100 lb.; muriate of potash, 20 lb	4,200	650	2,600	233	3,400	441	2,631	628	3
4	None	3,650		2,200		2,925		1,858		4
5	Acid phosphate, 100 lb.; muriate of potash, 20 lb.; nitrate soda, 30 lb.	4,000	133	2,000	—267	3,000	—67	3,040	898	5
6	Acid phosphate, 100 lb.; muriate of potash, 20 lb.; nitrate soda, 30 lb.	4,700	617	2,700	367	3,700	492	3,831	1,404	6
7	None	4,300		2,400		3,350		2,711		7
8	(Fertilized on corn and wheat only)	3,850	—200	2,200	33	3,025	—83	4,071	975	8
9	(Fertilized on corn and wheat only)	2,980	—820	2,000	67	2,490	—376	4,471	989	9
10	None	3 550		1,700		2 625		3 867		10
	Average unfertilized yield	3,710		2 250		2,980		2,682		
		Block G		Block F				Block H		
11	None	3,700		2,900		3,300		3,147		11
12	(Manured on corn and wheat only)	4,600	967	3,200	400	3,900	683	4,302	1,179	12
13	(Manured and fertilized on corn and wheat only)	3,960	333	2,800	100	3,350	216	3,964	864	13
14	None	3,500		2,600		3,050		3,076		14
15	(Manured and fertilized on corn and wheat only)	3,680	263	2,400	—417	3,040	—77	3,973	859	15
16	(Manured and fertilized on corn and wheat only)	3,200	—133	3,200	167	3,200	17	4,631	1,478	16
17	None	3,250		3,250		3,250		3,191		17
18	(Manured, limed and fertilized on corn and wheat only)	3,800	683	3,500	367	3,650	525	4,613	1,123	18
19	(Manured and fertilized on corn and wheat only)	2,900	—83	3,000	—17	2,950	—50	5,469	1,677	19
20	None	2 850		2 900		2 875		4 089		20
	Average unfertilized yield	3 320		2 912		3 116		4 492		

It is much too soon to attempt to draw any but the most general conclusions from this work. The underdrainage, done at the beginning of the experiment, has not yet had time fully to equalize moisture conditions, and there had been inequalities in manuring during the many years of cultivation before the land was brought under experiment, which will affect the results for years to come.

The results thus far attained, as shown in Tables 54, 55 and 56, indicate that all the fertilizing materials have produced an increased yield in corn, wheat and clover, although excess of nitrogen appears to be injurious, rather than beneficial, to soybeans.

In Table 57 the value of the increase in the four crops which have thus far come under experiment is computed on the two scales of valuations given. The table shows that phosphorus in acid phosphate, when used alone, has apparently increased the average yield sufficiently to repay its cost with more than 100 percent dividend. When added to manure, however, the acid phosphate has not increased the yield over that produced by manure alone.

TABLE 57.—Total fertilizing materials and cost, value of increase and net gain or loss per acre for one 4-year rotation, Washington County Experiment Farm

Plot	Total fertilizing materials					Value of increase		Cost of treatment		Net gain or loss (—)	
	Acid phosphate	Muriate potash	Nitrate soda	Ground limestone	Manure	Low	High	Low	High	Low	High
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Tons*	*Doll.*	*Doll.*	*Doll.*	*Doll.*	*Doll.*	*Doll.*
2	500	.....	.....	.....	.....	9.38	18.76	4.00	6.00	5.38	13.38
3	500	90	.....	.....	.....	8.85	17.70	6.25	28.50	2.60	—10.80
5	500	90	160	.....	.....	14.06	28.12	11.05	36.50	3.01	— 8.38
6	500	90	160	2,000	.....	21.61	43.22	14.05	40.00	7.56	3.22
8	250	180	400	.....	.....	19.58	39.16	18.50	68.00	1.08	—28.84
9	750	180	600	.....	.....	20.27	40.54	28.50	84.00	1.77	—43.46
12	.....	.....	.....	.....	4	19.33	38.66	2.00	3.00	17.33	35.66
13	500	.....	.....	.....	4	15.36	30.72	6.00	9.00	9.36	21.72
15	800	.....	.....	.....	4	12.69	25.38	8.40	12.60	4.29	12.78
16	800	.....	.....	.....	4	13.72	27.44	8.40	12.60	5.32	14.84
18	800	.....	.....	2,000	4	22.26	44.52	11.40	16.10	10.86	28.42
19	800	.....	.....	.....	8	16.57	33.14	12.40	15.60	4.17	17.54

Low values: Corn, 50c; soybeans, $2; wheat, $1 per bu.; hay, $10 per ton. Acid phosphate, $16 per ton; muriate of potash, 2½c per lb.; nitrate of soda, 3c per lb.; ground limestone, $3 per ton; manure, 50c per ton.

High values: Corn, $1; soybeans, $4; wheat, $2 per bu. Acid phosphate, $24 per ton; muriate of potash, 25c per lb.; nitrate of soda, 5c per lb.; ground limestone, $3.50 per ton; manure, 75c per ton.

When potassium has been added to the phosphorus there has been a further increase in the net gain at the low valuations, but at the high valuations both nitrogen and potassium have cost much more in fertilizers than their increase has been worth.

Ground limestone has apparently produced a profitable increase, as indicated by comparison of Plots 5 and 6 and 16 and 18.

The average increase on the 6 plots receiving manure has had a value of $16.65 at the low valuations, as against a value of $18.88 for the average increase on the four plots receiving the three fertilizing materials, which, however, have contained much smaller quantities of the essential elements of fertility than the manure. The ordinary farm cost of these elements in manure, however, is so much less than in fertilizers that manure may be used with profit in cases where the cost of fertilizers is prohibitive.

As stated above, however, it is too soon as yet to attempt any close comparison of the results of this experiment.

COMPARISON OF VARIETIES

CORN

Only four varieties of corn have been tested the full 4 years. Of the seven varieties tested in 1917, Cook's 75 is first, Clarage, second, and Darke County Mammoth, third. Of the varieties tested 4 years the Darke County Mammoth is first, Clarage, second, and Ohio 84, third.

TABLE 58.—Comparison of varieties, of Washington County Experiment Farm

Variety	Yield per acre				Average	
	1914 *Bu.*	1915 *Bu.*	1916 *Bu.*	1917 *Bu.*	Grain *Bu.*	Stover or straw *Lb.*
Corn						
Leaming (P. D.)	30.42	52.12	64.40	52.60	49.88	3,098
Reid (Orcutt)	39.98	58.70	.....	.....	.....	3,892
Cook's 75	.....	60.45	75.45	62.32	.....	3,963
Fleming White Cap	41.44	.....	69.44	.....	.....	3,312
Ohio 84	27.91	61.18	60.54	56.66	51.57	3,222
Clarage	32.35	56.04	57.10	61.80	51.82	3,389
Connor's Prolific	.....	58.85	70.60	51.56	.....	6,289
Darke County Mammoth	38.54	55.94	63.21	61.18	54.72	3,719
Reid Yellow Dent (Local)	.....	.....	.....	59.42	.....	5 260
Wheat						
Trumbull	.....	.....	14.26	16.96	15.61	1,407
Ohio 9920	.....	.....	19.90	18.29	19.09	1,405
Red Wave	.....	.....	14.82	11.68	13.25	1,285
Gladden	.....	.....	21.68	23.58	22.63	2,145
Nigger	.....	.....	21.82	23.46	22.64	2,125
Mediterranean	.....	.....	20.27	25.79	23.03	2,215
Velvet Chaff	.....	.....	14.96	19.29	17.12	1,511
Soybeans						
Mongol*	.....	18.68	10.72	.....	14.70	4,440
Elton*	.....	17.73	13.95	.....	15.84	2,980
Ebony*	.....	11.40	13.10	.....	12.25	2,550
Ohio 9100	.....	17.34	12.61	9.00	14.97	2,800
Ohio 9035	.....	22.57	10.89	.....	16.73	4,915
Medium Green	.....	11.62	9.16	9.75	10.35	3,098
New Era Cowpeas	.....	1.50	1.67	.....	1.58	4,005

*Not grown in 1917.

WHEAT

Seven varieties of wheat have been tested for two seasons. Average the results, the Mediterranean is first in yield, Nigger, second, and Gladden, third. The yields of the three highest are less than one-half bushel apart.

SOYBEANS AND COWPEAS

Six varieties of soybeans and one of cowpeas have been tested two seasons. Averaging the two tests, Ohio 9035 is first in yield of seed, Elton, second, and Ohio 9100, third.

In yields of straw, Ohio 9035 is also first, Mongol, second, and Medium Green, third. The New Era cowpeas give a good yield of straw but next to nothing in seed.

THE SHEEP FLOCK

The breeding flock of Merino ewes has been enlarged by the addition of seventeen 2-year-old ewes raised on the farm. In the summer of 1916 the ewes were bred to a purebred Southdown ram, with the expectation of selling all the lambs in the spring of 1917. On May 28, 1917, the wether lambs were sold for 14 cents per pound live weight, on the farm, and the ewe lambs were retained for breeding purposes. Under ordinary circumstances the Station does not recommend the keeping of such cross-bred ewes, but since unusual conditions threaten a shortage of wool and mutton, it seems advisable to retain all sound ewe lambs for breeding purposes.

EXPERIMENTS WITH TRUCK CROPS

The experiments on the Truck Farm consist chiefly of soil fertility studies and a comparison of cover crops, reinforced with chemical fertilizers. This is styled "soil improvement" work, to distinguish it from the regular soil fertility work.

The object of the "soil improvement" work is to determine to what extent leguminous cover crops may be used to increase the fertility of the soil. Chemical fertilizers are employed with cover crops and barnyard manure.

Four blocks of sixteen 1-40-acre plots each are used in each test, so that crops of different character may be grown in rotation. The plan of treatment and the arrangement of the plots are shown in the diagram, and Tables 59 to 63 report the yields obtained.

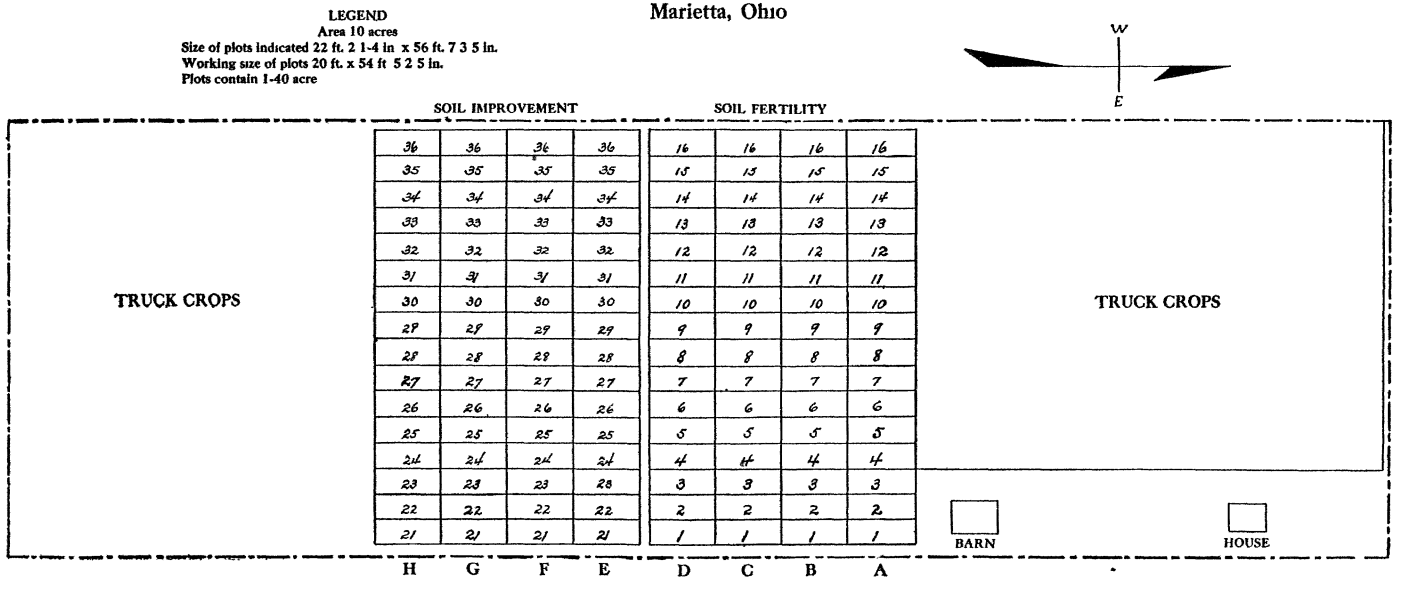
SOIL FERTILITY PLOTS		SOIL IMPROVEMENT PLOTS	
1	Unfertilized	21	No fertilizer. Mulched with straw Cover crop
2	Shed manure, 16 tons Acid phosphate, 400 lb.	22	Cover crop only
3	Shed manure, 16 tons	23	Manure, 16 tons Acid phosphate, 400 lb. Nitrate soda, 160 lb. Muriate potash, 50 lb.
4	Unfertilized	24	Manure, 16 tons
5	City manure, 16 tons	25	Manure, 16 tons Ground limestone, 1 ton
6	Acid phosphate, 800 lb. Nitrate soda, 320 lb. Muriate potash, 100 lb.	26	Manure, 16 tons Acid phosphate, 400 lb. Nitrate soda, 160 lb. Ground limestone, 1 ton
7	Unfertilized	27	Manure, 16 tons
8	Acid phosphate, 400 lb. Nitrate soda, 160 lb. Muriate potash, 50 lb.	28	Manure, 16 tons Acid phosphate, 400 lb. Ground limestone, 1 ton
9	Acid phosphate, 400 lb Nitrate soda, 160 lb.	29	Cover crop only
10	Unfertilized	30	Acid phosphate, 400 lb. Nitrate soda, 160 lb Muriate potash, 50 lb. Cover crop
11	Acid phosphate, 400 lb	31	Acid phosphate, 400 lb. Nitrate soda, 160 lb. Muriate potash, 50 lb Ground limestone, 1 ton Cover crop
12	Nitrate soda, 80 lb. Sulphate ammonia, 65 lb.	32	Cover crop only
13	Unfertilized	33	Ground limestone, 1 ton Cover crop
14	Nitrate soda, 160 lb. (In two applications)	34	Acid phosphate, 400 lb. Nitrate soda, 160 lb. Cover crop Ground limestone, 1 ton
15	Nitrate soda, 160 lb. (In one application)	35	Cover crop only
16	Unfertilized	36	Acid phosphare, 400 lb. Ground limestone, 1 ton Cover crop

Washington County Experiment Truck Farm: Plan of experiments in the use of fertilizers, manures and cover crops. Fertilizers and manures per acre. Plots 1-40acre

WASHINGTON COUNTY TRUCK EXPERIMENT FARM

Marietta, Ohio

LEGEND
Area 10 acres
Size of plots indicated 22 ft. 2 1-4 in x 56 ft. 7 3 5 in.
Working size of plots 20 ft. x 54 ft 5 2 5 in.
Plots contain 1-40 acre



Plan of Washington County Truck Experiment Farm

The detailed results of these experiments for 1915 are reported in Bulletin 303. Those for 1916 and 1917 and the average for the 3 years are given in Tables 59 to 64.

During the season of 1917 sweet corn sold at an average price equivalent to 1¾ cents a pound; cucumbers at 1 cent, cabbage at 1.4 cents and tomatoes at 3 cents. Taking the total weights of the 4 crops and the total receipts from sales the average amounts to 1¾ cents a pound.

It costs no more to plant and cultivate for a large yield than for a small one, but it does cost a little more to harvest the larger yield. In Table 65 the value of the average crops is therefore computed at 1½ cents a pound, allowing one-fourth cent for cost of harvesting.

At the prices above quoted there has been a wide range in the acre-value of the different crops. Taking the unfertilized land the average value of the corn has been $107 an acre; that of the cucumbers, $85; that of the cabbage, $205, and that of the tomatoes $303. The tomato and cabbage crops cost somewhat more to plant than the corn and cucumbers, and the tomatoes are staked at considerable expense. Moreover, the market gardener will grow a variety of crops in order to meet the demands of his customers, even though some of them yield less profit than others; while a different season or a different market might materially alter the relative position of the different crops.

The market gardener as a rule must depend upon purchased manure for a considerable part of his supply. For the crops of 1917 two carloads of manure were purchased in Columbus at $15 a car, f. o. b. Columbus, and two carloads were obtained from the cantonment in Chillicothe at merely the cost of transportation. The average cost of the two lots, including freight to Marietta, hauling out to the truck farm and spreading amounted to $2.50 per ton. The retail price of 16-percent acid phosphate has been increased to $22 to $24 a ton; that of nitrate of soda to 5 cents or more a pound, and muriate of potash is quoted at $400 to $500 a ton. This price is, of course, abnormal, but it is of interest to study the outcome of the use of manure and fertilizers in market gardening at prevailing prices, and Table 65 has been compiled for this purpose.

Taking first the unfertilized plots and comparing with the diagram on page 399, the table shows that there has been a diminished yield on the west side of the tract, but as the increase for each treated plot is computed by comparing it with the two untreated plots between which it lies this does not affect the general outcome.

Acid phosphate, when used alone (Plot 11), has apparently increased the yield by a value of $32.33. Nitrate of soda, on Plots 14 and 15, has produced an increase worth $8.72 in the average of the two plots, or 72 cents more than enough to pay its cost. When, however, nitrate of soda and acid phosphate are used together (Plot 9) the increase amounts to $49.07, giving a net gain of $36.27, thus confirming general experience that nitrate of soda or other carriers of nitrogen should always be used in connection with some carrier of phosphorus.

There are two comparisons of acid phosphate and manure, on the one hand, with manure without the phosphate on the other, namely: Plots 2 and 28 with Plots 3 and 25, both of which show a profitable increase for the additional treatment.

The lowering of the yield on Plot 8 when muriate of potash is added is probably due to soil variation and not to any injurious effect of the muriate, as Plot 30, receiving the same treatment, shows an increased yield. The increase, however, is not sufficient to justify the high cost of the potash.

Ground limestone, on Plot 33, has apparently increased the yield. When limestone has been added to acid phosphate (compare Plots 11 and 36) or to manure only (compare Plots 24 and 25) there has not been sufficient gain to cover the additional cost of the treatment. When added to the complete fertilizer (compare Plot 31 with Plot 30 and Plot 26 with Plot 8) the limestone has apparently increased the net gain.

A study of the effect of limestone on the different crops shows that it has apparently been less useful on tomatoes than on either corn, cucumbers or cabbage.

The results with manure are contradictory. On Plots 2 and 3 the cost of the manure has not been recovered in the increase of crop, while on Plots 24 and 27 there has been a margin of profit, and whenever the manure has been used in connection with fertilizers the outcome has been better than that from manure alone.

As the figures now stand the largest total value of crop has been produced on Plot 26—manure with acid phosphate, nitrate of soda and limestone—while the largest net gain is found on Plot 34—acid phosphate, nitrate of soda and limestone.

The following treatments stand close together in net gain, namely:

Plot 31:	Acid phosphate, muriate of potash, nitrate of soda, limestone, cover crop	$39.24
Plot 26:	Manure, acid phosphate, nitrate of soda, limestone	38.46
Plot 9:	Acid phosphate, nitrate of soda	36.27

TABLE 59.—Fertilizers, lime and manure on TRUCK CROPS, Washington County Truck Experiment Farm. Soil fertility Series, 1916

Plot No.	Treatment per acre for each crop	Yield and increase in pounds per acre										Plot No.
		Sweet Corn Block B		Cucumbers Block C		Cabbage Block D		Tomatoes Block A		Average		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
1	None	6,680	.....	4,880	.....	16,680	.....	10,440	.....	9,670	.....	1
2	Shed manure, 16 tons; acid phosphate, 400 lbs.	5,680	—640	5,880	1,653	22,800	6,240	12,320	1,733	11,670	2,247	2
3	Shed manure, 16 tons	5,520	—440	5,780	2,207	22,960	6,520	11,440	707	11,425	2.248	3
4	None	5,600	.....	2,920	.....	16,320	.....	10,880	.....	8,930	.....	4
5	City manure, 16 tons	5,920	373	5,000	1,680	21,000	4,160	12,060	1,173	10,995	1,847	5
6	Acid phos., 800 lb.; mur potash, 100 lb.; nit. soda 320 lb.	5,680	187	6,440	2,720	26,720	9,360	12,220	1,327	12,765	3,398	6
7	None	5,440	.....	4,120	.....	17,380	.....	10,900	.....	9,585	.....	7
8	Acid phos., 400 lb.; mur. potash, 50 lb. nit. soda, 160 lb.	5,880	160	6,240	2,633	22,440	5,640	10,780	—140	11,335	2,073	8
9	Acid phosphate, 400 lb., nitrate soda, 160 lb.	6,480	480	7,680	4,587	21,240	5,520	13,480	2,540	12,220	3,282	9
10	None	6,280	.....	2,580	.....	14,640	.....	10,960	.....	8,615	.....	10
11	Acid phosphate, 400 lb	6,800	507	4,160	1 507	17,720	3,827	12,960	1,560	10,410	1 850	11
12	Nitrate soda, 80lb.; sulphate ammonia, 65 lb	6,160	—147	2,960	233	16,080	2,933	12,620	780	9,455	950	12
13	None	6,320	.....	2,800	.....	12,400	.....	12,680	.....	8,450	.....	13
14	Nitrate soda, 160 lb. (in 2 applications)	6,200	—200	3,340	407	12,280	—53	11,240	—1 040	8,265	222	14
15	Nitrate soda, 160 lb. (in 1 application)	6,560	80	3,680	613	14,200	1,933	11,820	—460	9,065	542	15
16	None	6 560	.....	3 200	.....	12 200	.....	12,280	.....	8 560	.....	16
	Average unfertilized yields	6,560	.....	3,300	.....	15 020	.....	11,290	.....	9 042	.....	

TABLE 60—Fertilizers, lime and manure on TRUCK CROPS: Washington County Truck Experiment Farm, Soil Fertility Series, 1917

Plot	Treatment per acre for each crop	Yield and increase in pounds per acre										Plot
		Sweet Corn Block C		Cucumbers Block D		Cabbage Block A		Tomatoes Block B		Average		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
1	None	6,880	.....	12,780	.....	15,920	.....	8,600	.....	11,045	.....	1
2	Shed manure, 16 tons; acid phosphate, 400 lb	7,240	587	13,680	1,693	21,960	6,253	14,860	4,987	14,435	3,380	2
3	Shed manure, 16 tons	6,920	493	12,440	1,247	19,080	3,587	15,760	4,613	13,550	2,485	3
4	None	6,200	.....	10,400	.....	15,280	.....	12,420	.....	11,075	.....	4
5	City manure, 16 tons	7,160	693	9,640	—1,440	20,040	5,053	15,420	2,993	13,065	1,825	5
6	Acid phos., 800 lb.; mur. potash, 100 lb. nit. soda 320 lb.	8,000	1,267	16,480	4,720	20,080	5,387	14,020	1,587	14,645	3,240	6
7	None	7,000	.....	12,440	.....	14,400	.....	12,440	.....	11,570	.....	7
8	Acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda 160 lb	7,560	347	14,200	2,660	19,080	4,907	12,760	267	13,350	2,045	8
9	Acid phosphate, 400 lb.; nitrate soda, 160 lb	8,040	1,013	14,720	4,080	17,780	3,833	15,660	3,113	14,050	3,010	9
10	None	7,040	.....	9,740	.....	13,720	.....	12,600	.....	10,775	.....	10
11	Acid phosphate, 400 lb	8,080	1,213	8,980	1,067	15,600	733	12,940	1,560	11,400	1,143	11
12	Nitrate soda, 80 lb.; sulphate amonia, 65 lb	7,600	907	5,620	—467	16,560	547	9,540	—620	9,830	92	12
13	None	6,520	.....	4,260	.....	17,160	.....	8,940	.....	9,220	.....	13
14	Nitrate soda, 160 lb. (in 2 applications)	7,040	347	9,500	4,493	18,640	2,667	9,360	527	11,135	2,008	14
15	Nitrate soda, 160 lb. (in 1 application)	7,040	173	9,160	3,407	17,320	2,533	10,060	1,333	10,895	1,862	15
16	None	7,040	.....	6,500	.....	13,600	.....	8,620	.....	8,940	.....	16
	Average unfertilized yields	6,780	.....	9,353	.....	15,013	.....	10 603	.....	10,437	.....	

TABLE 61.—Fertilizers, lime and manure on TRUCK CROPS: Washington County Truck Experiment Farm
Soil fertility series—3-year average, 1915-1917

Plot	Treatment per acre for each crop	Yield and increase in pounds per acre										Plot
		Sweet corn		Cucumbers		Cabbage		Tomatoes		Average		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
1	None	6,707	.....	10,800	.....	16,187	.....	12,073	.....	11,442	.....	1
2	Shed manure, 16 tons; acid phosphate, 400 lb	6,420	116	12,733	3,175	21,160	4,898	14,393	2,260	13,676	2,612	2
3	Shed manure, 16 tons	6,267	364	11,113	2,798	19,667	3,329	14,230	2,037	12,819	2,132	3
4	None	5,500	.....	7,073	.....	16,413	.....	12,253	.....	10,310	.....	4
5	City manure, 16 tons	6,640	1,009	9,560	1,927	19,067	2,782	14,127	2,124	12,348	1,960	5
6	Acid phos., 800 lb.; mur. potash, 100 lb.; nit. soda, 320 lb.	7,053	1,291	11,833	3,640	21,987	5,831	15,183	3,432	14,014	3,551	6
7	None	5,893	.....	8,753	.....	16,027	.....	11,500	.....	10,543	.....	7
8	Acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb.	6,540	622	13,500	5,034	19,807	4,273	12,743	1,169	13,147	2,774	8
9	Acid phos., 400 lb.; nitrate soda, 160 lb.	6,887	944	13,340	5,162	19,007	3,967	14,660	3,011	13,473	3,271	9
10	None	5,967	.....	7,890	.....	14,547	.....	11,723	.....	10,032	.....	10
11	Acid phosphate, 400 lb	7,047	951	10,940	3,694	16,773	2,138	13,453	1,836	12,053	2,155	11
12	Nitrate soda, 80 lb.. sulphate ammonia, 65 lb.	6,140	— 84	6,063	—536	15,973	1,249	10,967	— 546	9,786	21	12
13	None	6,353	.....	5,953	.....	14,813	.....	11,407	.....	9,631	.....	12
14	Nitrate soda, 160 lb. (in 2 applications)	6,167	—275	9,027	2,316	15,253	1,031	9,733	—1,342	10,045	432	14
15	Nitrate soda, 160 lb. (in 1 application)	6,560	29	9,150	1,681	15,320	1,689	10,267	— 478	10,324	730	15
16	None	6,620	.....	8,227	.....	13,040	.....	10,413	.....	9,575	.....	16
	Average unfertilized yield	6,173	.....	8,116	.....	15,171	.....	11,562	.....	10,255	.....	

TABLE 62.—Fertilizers, lime and manure on TRUCK CROPS: Washington County Truck Experiment Farm. Soil improvement series, 1916

Plot	Treatment per acre for each crop	Yield and increase in pounds per acre										Plot
		Sweet corn Block F		Cucumbers Block G		Cabbage Block H		Tomatoes Block E		Average		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
21	Straw mulch. Cover crop	6,360	.....	16,360	.....	22,480	.....	9,320	.....	13,630	.....	21
22	Cover crop only	6,600	.....	14,600	.....	14,240	.....	10,580	.....	11,505	.....	22
23	Manure, 16 tons; acid phos., 400 lb.; mur. potash, 50 lb.; nitrate soda, 160 lb.	6,640	—100	24,040	8,470	23,640	10,620	13,560	3,410	16,970	5,600	23
24	Manure, 16 tons	7,120	380	19,680	4,110	21,360	8,340	16,720	6,570	16,220	4,850	24
25	Manure, 16 tons; ground limestone, 1 ton	6,600	—140	18,360	2,790	20,960	7,940	15,540	5,390	15,365	3,995	25
26	Manure, 16 T.; acid phos., 400 lb.; nit. soda, 160 lb.; ground limestone, 1 T.	6,880	140	23,760	8,190	23,560	10,540	12,560	2,410	16,690	5,320	26
27	Manure, 16 tons	6,800	60	20,440	4,870	17,840	4,820	16,140	5,990	15,305	3,935	27
28	Manure, 16 tons; acid phos.; 400 lb.; ground limestone, 1 ton	6,600	—140	21,720	6,150	19,880	6,860	14,400	4,250	15,650	4,280	28
29	Cover crop only	6,880	.....	15,400	.....	11,800	.....	9,910	.....	11,000	.....	29
30	Acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb. Cover crop	7,200	413	22,720	6,940	20,200	9,347	11,160	1,307	15,320	4,502	30
31	Acid phos., 400 lb.; mur. potash, 50 lb.; nitrate soda, 160 lb., ground limestone, 1 ton. Cover crop	7,600	907	22,480	6,320	22,280	12,373	10,440	653	15,700	5,063	31
32	Cover crop only	6,600	.....	16,540	.....	8,960	.....	9,720	.....	10,455	.....	32
33	Ground limestone, 1 ton. Cover crop	7,560	920	18,180	2,567	13,320	4,947	11,520	1,753	12,645	2,547	33
34	Acid phos.; 400 lb.; nit.; soda, 160 lb.; ground limestone, 1 ton. Cover crop	6,880	200	21,080	6,393	21,000	13,213	12,000	2,187	15,240	5,498	34
35	Cover crop only	6,720	.....	13,760	.....	7,200	.....	9,860	.....	9,385	.....	35
36	Acid phosphate, 400 lb.; ground limestone, 1 ton. Cover crop	6,640	— 80	11,600	—2,160	15,080	7,880	10,420	560	10,935	1,550	36
	Average of check plots 2 and 9	6,740	.....	15,570	.....	13,020	.....	10,150	.....	11,370	.....	
	Average of check plots 9, 12 and 15	6,733	.....	15,233	.....	9,320	.....	9,833	.....	10,280	.....	

TABLE 63.—Fertilizers, lime and manure on TRUCK CROPS: Washington County Truck Experiment Farm
Soil improvement series, 1917

Plot	Treatment per acre for each crop	Yield and increase in pounds per acre										P lot
		Sweet corn Block G		Cucumbers Block H		Cabbage Block E		Tomatoes Block F		Average		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
21	Straw mulch. Cover crop	5,840	.....	7,620	.....	10,760	.....	7,520	.....	7,935	.....	21
22	Cover crop only	4,920	.....	3,040	.....	13,840	.....	10,420	.....	8,055	.....	22
23	Manure, 16 tons; acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb.	7,600	2,140	9,920	7,490	26,600	11,980	17,740	7,470	15,465	7,270	23
24	Manure, 16 tons	7,440	1,980	8,620	6,190	22,640	8,020	16,000	5,730	13,675	5,480	24
25	Manure, 16 tons; ground limestone, 1 ton	9,120	3,660	10,200	7,770	23,280	8,660	18,020	7,750	15,155	6,960	25
26	Manure, 16 tons; acid phos., 400 lb.; nit. soda, 160 lb.; ground limestone, 1 T.	8,960	3,500	22,520	20,090	27,440	12,820	17,200	6,930	19,030	10,855	26
27	Manure, 16 tons	8,760	3,300	11,340	8,910	21,320	6,700	17,500	7,230	14,730	6,535	27
28	Manure, 16 tons; acid phos., 400 lb.; ground limestone, 1 ton	9,600	4,140	13,960	11,530	25,000	10,380	18,620	8,350	16,795	8,600	28
29	Cover crop only	6,000	.....	1,820	.....	15,400	.....	13,300	.....	9,130	.....	29
30	Acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb. Cover crop	7,680	1 533	7 780	5 380	19 800	4 307	12 960	720	12 055	2 985	30
31	Acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb.; ground limestone, 1 ton. Cover crop	8,520	2,227	9,320	6,340	22,800	7,213	13,360	2,180	13,500	4,490	31
32	Cover crop only	6,440	.....	3,560	.....	15,680	.....	10,120	.....	8,950	.....	33
33	Ground limestone, 1 ton. Cover crop	7,160	1,093	4,520	1,213	19,120	4,120	11,420	1,107	10,555	1,883	33
34	Acid phos., 400 lb.; nit. soda, 160 lb.; ground limestone, 1 ton. Cover crop	8,000	2,307	6,220	3,167	21,920	7,600	13,360	2,853	12,375	3,982	34
35	Cover crop only	5,320	.....	2,800	.....	13,640	.....	10,700	.....	8,115	.....	35
36	Acid phos., 400 lb.; ground limestone, 1 ton. Cover crop	7,080	1,760	2 280	—520	14 960	1 320	11,340	640	8,915	800	36
	Average of check plots 2 and 9	5,460	.. .	2 430	....	14 620	.....	10 270	.....	8 195	.....	
	Average of check plots 9, 12 and 15	5,920	.....	2,727	.. ....	14 907	. ....	11,373	.....	8 732	.....	

TABLE 64—Fertilizers, lime and manure on TRUCK CROPS: Washington County Experiment Farm Soil Improvement series, 3-year average, 1915-1917

Plot	Treatment per acre for each crop	Yield and increase in pounds per acre										Plot
		Sweet Corn		Cucumber		Cabbage		Tomatoes		Average		
		Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	Yield	Increase	
21	Cover crop; straw mulch	6,000	.....	9,493	.....	16,493	.....	8,947	.....	10,233	.....	21
22	Cover crop only	5,600	.....	7,917	.....	15,267	.....	10,053	.....	9,709	.....	22
23	Manure, 16 tons; Acid phos. 400 lb.; mur. potash 50 lb.; nitrate soda, 160 lb.	7,053	1,093	17,767	8,557	24,067	9,054	14,070	4,307	15,739	5,753	23
24	Manure, 16 tons	6,900	940	14,567	5,357	20,667	5,654	14,133	4,370	14,067	4,081	24
25	Manure, 16 tons; limestone, 1 ton	7,380	1,420	14,473	5,263	20,587	5,574	14,193	4,430	14,158	4,172	25
26	Manure, 16 ton; Acid phos., 400 lb.; nitrate soda, 160 lb.; limestone, 1 ton	7,473	1,513	20,707	11,497	23,880	8,867	13,180	3,417	16,310	6,324	26
27	Manure, 16 tons	7,260	1,300	15,673	6,463	19,000	3,987	13,627	3,864	13,890	3,976	27
28	Manure, 16 tous; Acid phos. 400 lb.; limestone, 1 ton	7,567	1,607	18,023	8,813	20,733	5,720	14,010	4,247	15,083	5,168	28
29	Cover crop only	6,320	.....	10,503	.....	14,760	.....	9,473	.....	10,264	.....	29
30	Acid phos., 400 lb. mur. potash, 56 lb.; nitrate soda, 160 lb. cover crop	7,320	982	16,407	6,963	20,560	6,147	10 470	1 731	13 689	3,738	30
31	Acid phos. 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb.; limestone, 1 ton cover crop	7,733	1,378	16,633	6,510	22,200	8,133	9,953	1,947	14,140	4,502	31
32	Cover crop only	6,373	.....	9,933	.....	13,720	.....	7,270	.....	9,324	.....	32
33	Limestone, 1 ton cover crop	6,733	509	11,447	2,197	16,920	3,911	8,613	1,144	10,928	1,942	33
34	Acid phos. 400 lb. nitrate soda, 160 lb.; limestone, 1 ton; cover crop	7,393	1,318	15,240	6,673	21,627	9,329	10,410	2,742	13,667	5,015	34
35	Cover crop only	5,927	.....	7 883	.....	11,587	.....	7,867	.....	8,316	.....	35
36	Acid phos., 400 lb.; limestone, 1 ton; cover crop	6,793	867	9 633	1 750	15 907	4 320	9 360	1 493	10 423	2 107	36
	Average of check of lots 2 and 9, 5	5,960	.....	9,210	.....	15 013	.....	9 763	.....	9 986	.....	
	Average of check of lots 9, 12, 15	6,207	.....	9,440	.....	13 356	.....	8,203	.....	9 301	.....	

TABLE 65.—Average annual value of TRUCK CROPS, Washington County Truck Experiment Farm. Increase due to treatment and net gain or loss per acre

Plot	Treatment per acre	Average value	Increased value	Cost of treatment	Net gain or loss (—)
		Dollars	*Dollars*	*Dollars*	*Dollars*
1	None	171.63			
2	Shed manure, 16 tons; acid phos., 400 lb	205.14	39.17	44.80	— 5.63
3	Shed manure, 16 tons	192.28	31.97	40.00	— 8.03
4	None	154.65			
5	City manure, 16 tons	185.22	29.41	40.00	—10.59
6	Acid phos., 800 lb.; mur. potash, 100 lb.; nit. soda, 320 lb.	210.21	53.23	50.60	2.63
7	None	158.14			
8	Acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb.	197.20	41.61	25.30	16.31
9	Acid phosphate, 400 lb.; nitrate soda, 160 lb.	202.10	49.07	12.80	36.27
10	None	150.48			
11	Acid phosphate, 400 lb	180.80	32.33	4.80	27.53
12	Nitrate soda, 80 lb.; sulphate ammonia, 65 lb	146.80	—.33	8.00	— 8.67
13	None	144.46			
14	Nitrate soda, 160 lb. (in 2 application)	150.67	6.49	8.00	— 1.51
15	Nitrate soda, 160 lb. (in 1 application)	154.86	10.96	8.00	2.96
16	None	143.62			
21	Cover crop. Straw mulch	153.50	7.87		
22	Cover crop only	145.63			
23	Manure, 16 tons; acid phos., 400 lb.; mur. potash, 50 lb.; nitrate soda, 160 lb.	236.08	89.26	65.30	23.96
24	Manure, 16 tons	211.00	63.00	40.00	23.00
25	Manure, 16 tons; limestone, 1 ton	212.37	63.17	43.00	20.17
26	Manure, 16 tons; acid phos., 400 lb.; nit. soda, 160 lb.; limestone, 1 ton	244.65	94.26	55.80	38.46
27	Manure, 16 tons	208.35	56.77	40.00	16.77
28	Manure, 16 tons: acid phos., 400 lb.; limestone, 1 ton	226.24	73.47	47.80	25.67
29	Cover crop only	153.96			
30	Acid phos., 400 lb,; mur. potash, 50 lb.; nit. soda, 160 lb. Cover crop	205.33	56.07	25.30	30.77
31	Acid phos., 400 lb.; mur. potash, 50 lb.; nit. soda, 160 lb.; limestone, 1 ton. Cover crop	212.10	67.54	28.30	39.24
32	Cover crop only	139.86			
33	Limestone, 1 ton. Cover crop	163.92	29.09	3.00	26.09
34	Acid phos., 400 lb.: nit. soda, 160 lb.; limestone, 1 ton. Cover crop	205.00	75.20	15.80	59.40
35	Cover crop only	124.77			
36	Acid phos., 400 lb.; limestone, 1 ton. Cover crop	156.34	31.57	7.80	23.77

Of course, different prices of manure or fertilizers would alter the outcome. Disregarding the cost of treatment, the largest total gains are found in the following plots:

Plot 26: Manure, acid phosphate, nitrate of soda, limestone....$94.26
Plot 23: Manure, acid phosphate, muriate of potash, nitrate of soda 89.26
Plot 34: Acid phosphate, nitrate of soda, limestone..... 75.20
Plot 28: Manure, acid phosphate, limestone..... 73.47

It will be observed that whether we consider total gain or net gain, acid phosphate enters into the treatment every time, although acid phosphate alone is not sufficient.

The conclusions above suggested are of course only tentative. The work must be carried much farther before definite conclusions will be justified, but it seems to be a safe proposition to use acid phosphate on truck crops in this region.

COST OF MANURE

The cost of manure is an important item to the truck farmer. The following statement gives the actual cost of the manure used on the Washington County Truck Farm. Part of this manure was purchased in Columbus, and part was obtained from the army cantonment at Chillicothe. There was no charge by the Government for this manure.

April 30, 1916.

One car of manure from Columbus, 34.65 tons, demurrage		$ 3.00
Cost at Columbus per car		15.00
Freight at $1.05 per ton		36.38
Hauling and spreading 11 days at $3		33.00
Total cost per		$87.38
Cost per ton at Marietta	$1.57*	
Cost of spreading and hauling	.95	
Total cost per ton spread on the land	2.52	

December 31, 1916.

One care of manure from Columbus, 24.9 tons		
Cost at Columbus per car		$15.00
Freight at $1.05 per ton		26.15
Hauling and spreading 8 days at $3		24.00
Total cost		$65.15
Cost per ton at Marietta	$1.64	
Cost hauling and spreading	.96	
Total cost per ton spread on the land	$2.60	

December 28, 1917, and March 9, 1918.

Two cars of manure from Chillicothe, 48 tons		$ 00.00
Cost at Chillicothe per car		
Freight and expense $1.29 per ton		61.77
Hauling and spreading 14½ days at $3.50		50.75
Total cost		$112.52
Cost per ton at Marietta	$1.29	
Cost of hauling and spreading	1.06	
Total cost per ton spread on the land	$2.35	

The dates given are those on which the manure was received at Marietta.

The charge per day for man and team is placed low because the team would otherwise have been idle. Owing to the scarcity of labor the charge for man and team in 1918 was placed 16 percent higher. This helps to make the cost of manure more uniform also. The same cause that provided the cheaper manure caused the scarcity of labor and the resulting higher wage.

*The $1.57 includes the demurrage charge of $3 on the car.

BULLETIN

OF THE

Ohio Agricultural Experiment Station

NUMBER 323 MAY, 1918

COUNTY EXPERIMENT FARMS IN OHIO

PART VI

THE TRUMBULL COUNTY EXPERIMENT FARM

SECOND AND THIRD ANNUAL REPORTS, FOR 1916 AND 1917

C. W. MONTGOMERY, CHIEF

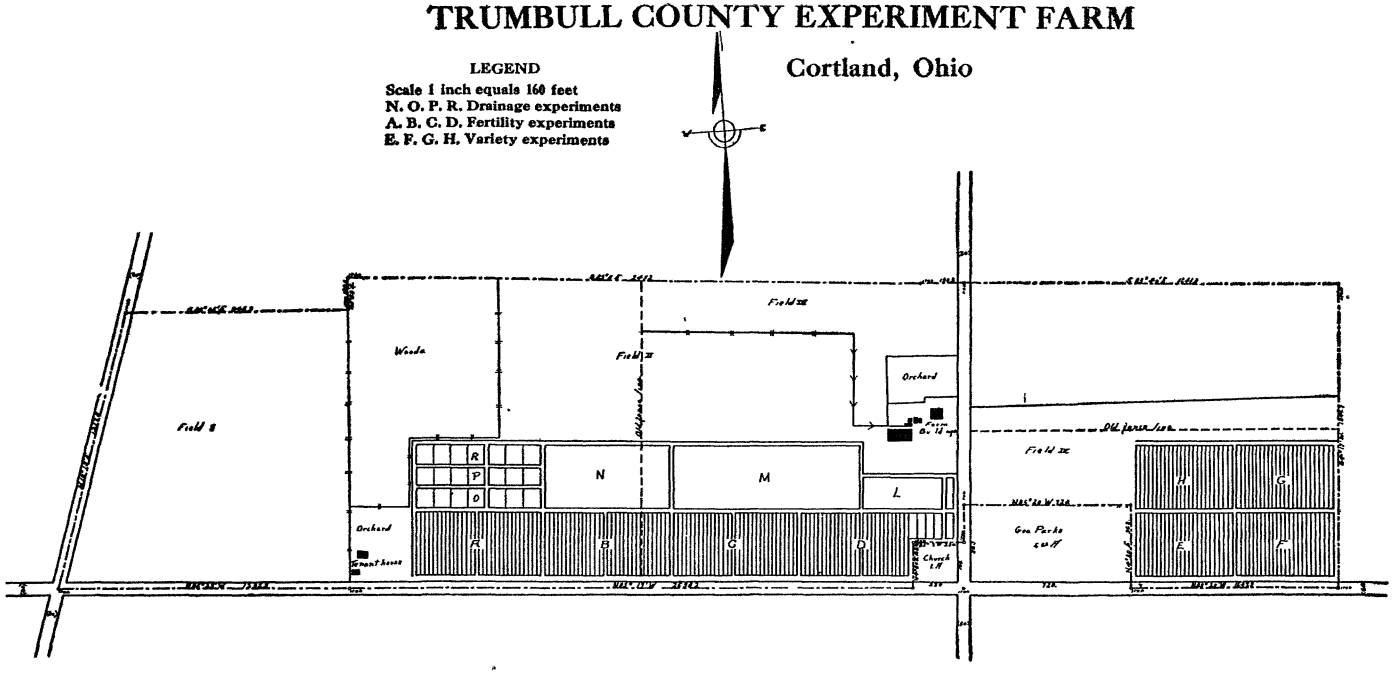
M. O. BUGBY, SUPERINTENDENT
CARL M. RUNKLE, FOREMAN

PERSONNEL

Operations on the Trumbull County Experiment Farm were started the spring of 1915 with M. O. Bugby, Superintendent, and Carl M. Runkle, Foreman. In December, 1916, Mr. Runkle was transferred to the Mahoning County Experiment Farm and D. E. Woodford appointed foreman.

FARM IMPROVEMENTS

The work of equipping the barn to accommodate the dairy herd was completed during the year. A silo, 10 by 40 feet, a dairy house, and a water system which serves both residence and dairy were also constructed.



Plan of Trumbull County Experiment Farm

TRUMBULL COUNTY STATISTICS

POPULATION (U. S. Census)

Census year	1860	1870	1880	1890	1900	1910
Total		38,659	44,880	42,373	46,591	52,766
White		38,425	44,635	41,176	46,342	52,555
Negro		233	245	195	247	208
Foreign born		8,091	8,688	6,395	6,581	7,808
Rural					27,964	29,588
Urban					18,627	23,178

Population, 1910: Warren 11,081; Niles 8,361; Girard 3,765; Hubbard 1,699;

FARMS (U. S. Census)

FARMS: U. S. CENSUS	1880	1890	1900	1910
Approximate land area—Acres				405,120
Land in farms—Acres	396,023	358,980	377,552	365,859
Improved land in farms—Acres	310,112	299,902	240,147	253,073
Woodland in farms—Acres	78,633	59,078	137,405	58,157
Other unimproved land in farms—Acres	7,278			54,629
Total number of farms—Number	3,891	3,940	4,345	4,456
Area of average farm—Acres	101.8	91.1	86.9	82.1
Improved land per farm—Acres	79.7	76.1	55.3	56.8
Value of all property per farm—Dollars	4,892	4,012	3,803	5,178
Value of land and buildings per farm—Dollars	4,273	3,414	3,206	4,451
Value of land and buildings per acre—Dollars	41.70	37.48	36.89	54.21

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses—Number	8,290	9,552	9,649	10,804	11,610	7,777
Cattle—Number	41,282	83,503	38,235	35,318	28,115	26,585
Sheep—Number	60,954	98,562	45,056	59,922	40,968	26,585
Hogs—Number	9,215	7,299	7,129	7,115	6,543	5,776
Cattle equivalent* Total			53,102	52,826	44,476	36,537
Cattle equivalent* Per 1000 Acres			171	176	185	144

FARM CROPS: 10-year average production (Ohio statistics)

Decennium	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn—acres	16,165	10,363	13,888	13,394	14,168	14,142
Bushels	344,249	425,634	657,406	408,219	443,790	398,705
Bushels per acre	30.9	41.1	53.7	30.5	31.2	28.2
Oats—acres	8,793	10,225	14,722	17,373	19,415	19,928
Bushels	200,469	270,169	479,676	568,996	625,461	631,286
Bushels per acre	22.8	26.4	32.5	32.8	32.2	31.7
Wheat—acres	9,125	5,104	7,255	13,376	14,103	9,653
Bushels	112,595	63,371	101,294	200,449	218,035	140,739
Bushels per acre	12.3	12.4	13.9	15.0	15.5	14.6
Rye—acres	2,414	963	461	207	388	377
Bushels	9,053	10,073	5,069	2,211	3,423	4,802
Bushels per acre	3.8	10.5	10.9	10.7	8.8	12.7
Meadows—acres	50,087	50,891	54,658	50,755	48,178	52,552
Tons	62,377	59,580	60,324	60,364	60,235	63,668
Tons per acre	1.24	1.17	1.10	1.19	1.25	1.21
Clover—acres		805	1,086	4,791	3,217	1,213
Tons		1,084	1,414	6,145	4,430	1,805
Tons per acre		1.35	1.30	1.28	1.38	1.48
Potatoes—acres		1,495	1,617	1,994	2,809	3,580
Bushels		141,061	163,490	174,404	289,384	310,424
Bushels per acre		94.4	101.1	87.5	103.1	86.7
Orchards—acres		5,148	5,495	5,616	5,143	4,600
Apples—bushels		137,837	247,753	282,847	178,334	220,194

*Computing ten hogs or sheep equal to 1 horse or cow for manure producetion.

CROP AND LABOR STATISTICS OF THE TRUMBULL COUNTY EXPERIMENT FARM FOR 1916

Area of farm, 153 2 A
Crop area 63.97 A

Other areas undetermined 89.23

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK				
Corn: fertility and variety cut for silage	52	5.41	60,983 lbs.	5.64 tons
Corn: silage variety test	10	.875	7,660 lbs.	4.38 tons
Oats	63	5.65	6.423.5 lbs.	35.53 bu.
Soybeans: followed rye	12	1.05	578 lbs.	9.17 bu.
Wheat	74	6.35	8,272 lbs.	21.71 bu.
Rye	4	.2	232 lbs.	20.71 bu.
Barley	1	.1	60 lbs.	12.5 bu.
Emmer	1	.1	50.5 lbs.	15.78 bu.
Spring wheat	1	.1	34 lbs.	5.67 bu.
Hay				
cowpea (followed rye) weedy	1	.0875	140 lbs.	8. tons
soybean (.4375 acres followed rye)	15	1.35	2,540 lbs.	.94 tons
pea and oat	7	.35	1,315 lbs.	1.88 tons
Plots not harvested 1916	9	.71		
	250	22.33		
Less plots producing two crops	18	1.575		
Total	232	20.76		
FIELD WORK				
Corn (silage)		13.25	117,490 lbs.	4.76 tons
Soybeans		2.	2,280 lbs.	19. bu.
Wheat		11.	15,500 lbs.	23.48 bu.
Potatoes		1.2	5,400 lbs.	75. bu.
Rye		3.62	5,052 lbs.	24.92 bu.
Rye: (silage)		6.	48,959 lbs.	4.07 tons
Buckwheat		7.85	7,406 lbs.	18.85 bu.
Hay				
mixed		12.2	63,614 lbs.	2.61 tons
pea and oat		2.75	4,625 lbs.	.84 tons
soybean		4.2	12 500 lbs.	1.48 tons
		64.07		
Unharvested area: soys disked in		1.		
Total crop acres		63.97		
Less plot acres		20.76		
Total field acres		43.21		

Number work horses used on Trumbull County Experiment Farm in 1916 4
Number man hours per year (March 1, 1916 to February 28, 1917 inclusive) 13,121
Number horse hours per year (March 1, 1916 to February 28, 1917 inclusive) 4,869
Number of tractor hours per year (March 1, 1916 to February 28, 1917 inclusive) 447

CROP AND LABOR STATISTICS OF THE TRUMBULL COUNTY EXPERIMENT FARM FOR 1917

Area in farm ..... 153.2 Acre
Crop area 1917 ..... 94.87 Acre
Other area undetermined ..... 89.23 Acre

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK				
Corn	53	5.6	16,442 lbs.	41.94 bu.
Silage: corn	30	5.63	113,466 lbs.	10.08 ton
corn and soybean	8	.8	15,770 lbs.	9.09 ton
rye	13	1.64	9,931 lbs.	3.03 ton
Oats	61	6.03	10,580 lbs.	54.83 bu.
Soybeans	13	2.59	901 lbs.	5.8 bu.
Wheat	67	5.99	14,474 lbs.	40.27 bu.
Rye	16	1.42	2,532 lbs.	29.72 bu.
Potatoes	15	.79	4,619 lbs.	95.34 bu.
Hay: clover and timothy	30	3.4	9,721 lbs.	1.52 ton
alfalfa (three cuttings)	2	1.04	7,425 lbs.	1.19 ton
sweet clover	9	1.02	11,345 lbs.	5.56 ton
soybean	14	1.98	9,650 lbs.	2.44 ton
cowpea	1	.1	410 lbs.	2.05 ton
pea oat	1	.1	550 lbs.	2.75 ton
Total plots and plot acres	333	38.13	.....	.....
FIELD WORK				
Corn: silage		4.37	67,235 lbs.	15.38 ton
silage		3	not harvested	
Oats: grain		.15	320 lbs.	66.67 bu.
forage		.2	2,630 lbs.	6.58 ton
Wheat		11.28	23,958 lbs.	35.44 bu.
Rye: grain		2.5	4,380 lbs.	29.2 bu.
silage		10.7	49,250 lbs.	2.3 ton
Beans		.39	100 lbs.	4.27 bu.
Sweet corn		1.66	186 doz.	112 doz.
Hay: clover and timothy (2.7 acres cut twice)		13.2	62,103 lbs.	2.35 ton
soybean		2.	4,000 lbs.	1 ton
soybean		6.39	not harvested	
pea and oat		.9	7,685 lbs.	4.27 ton
Total field acres		56.74	.....	.....
Plus plot acres		38.13	.....	.....
Total crop acres		94.87	.....	.....

Plot yields per acre	Corn	Oats	Soys	Wheat	Rye	Silage Corn	Hay Soybean	Hay Clover & Timothy
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Ton.*	*Ton.*	*Ton.*
High	80.75	75.93	8.07	58.33	38.	16.55	1.94	1.85
Low	3.85	37.81	4.23	37.	18.33	1.07	.89	.71

Number work horses used on Trumbull County Experiment Farm in 1917 4
Number crop acres per work horse 23.72
Number horse hours per year (March 1, 1917 to February 28, 1918 inclusive) ..... 11,507.
Number man hours per year (March 1, 1917 to February 28, 1918 inclusive) ..... 4,850.
Number tractor hours per year (March 1, 1917 to February 28, 1918 inclusive) ..... 155.

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1917

RECEIPTS

From county treasury:		
Balance forward from 1915	$16.52	
Appropriations for year 1916	1,663.59	
		$1,680.11
From farm sales:		
Livestock and livestock products—cattle $1,969.64; milk and cream $2,595.71; butterfat $16.93	4,582.28	
Grain and beans—wheat $537.21; rye $43.74; buckwheat $163.54; soybeans $10.40	754.89	
Truck crops—potatoes $17.50; miscellaneous crops $8.85	26.35	
Supplies—acid phosphate $28.48; gasoline $1.40; sacks $9.78	39.66	
Equipment—threshing machine	269.50	
		5,672.68
Total receipts		$7,352.79

EXPENDITURES

For labor		$1,801.95
For current expenses—seeds, etc. $132.25; fertilizer, lime, etc. $370.32; spray materials $4.25; telephone and telegraph $51.78; transportation $152.50; fuel and light $272.23; blacksmithing and repairs $170.75; lubricants and ignition $39.36; harvesting $43.55; unclassified $24		$1,260.99
For machinery and tools		818.93
For permanent improvement:		
Building material and construction	$725.16	
Water supply	158.92	
Plot work fixtures	15.68	
		899.76
For livestock:		
Purchases—cattle	$1,310.00	
Maintenance—feeds $1,169.06; veterinary, medicine, etc. $12.65; livestock fees $66.45; straw $1.20	1,249.36	
		2,559.36
Total expenditures		7,340.99
Balance in county treasury February 28, 1917		11.80
		$7,352.79

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1918

RECEIPTS

From county:		
Balance in treasury March 1, 1917		$ 11.80
Maintenance fund distribution		2,000.00
From farm sales:		
Livestock and livestock products—calves $27; milk $2,544.20; butterfat $62.97	$2,634.17	
Crops—oats $175.61; soybeans $107.37; wheat $1,220.16; rye $146.32; potatoes $181.97; sweet corn $31.37; miscellaneous $4.98	1,867.78	
Sundries—fertilizers $5.93; containers $4.36; silo filling $27.50; old poultry house $5; miscellaneous hardware $0.25; hauling milk $124.10	567.14	
		4,669.09
From Ohio Agricultural Experiment Station (feed and seed)		400.00
Total receipts		$7,080.89

EXPENDITURES

For labor		$2,175.05
For current expenses—feeds $1,419.32; veterinary services $13.50; livestock fees, etc. $44.40; livestock equipment $229.60; seeds $244.49; fertilizers and lime $547.23; blacksmithing and repairs $326.61; building repair $29.50; communication $71.53; office supplies $14.02; miscellaneous hardware $4.42; dairy supplies $12.69; threshing, etc. $60.40; containers $22.38; plot fixtures $9.13		3,078.95
For machinery and tools		5.40
For permanent improvements:		
Building material and construction	$226.43	
Concrete material	20.59	
Water supply	4.59	
Drainage material	974.75	
Fence material	2.40	
		1,228.76
For livestock:		
Purchase—dairy cattle		255.00
Total expenditure		$6,743.16
Balance in county treasury February 28, 1918		313.35
In hands of superintendent for payment of small bills		24.38
		$7,080.89

FINANCIAL SUMMARY

Inventory of Permanent Investment (Cost) and Operating Equipment

March 1, 1917

Land—original cost	$15,432.94	
Tile drainage	5,137.86	
Total land and drainage		$20,570.80
Permanent improvements:		
Remodeling barn	$677.25	
Dairy house	353.02	
Water system	443.73	
Silo	369.72	
Fence (60 rods erected 1915)	55.00	
Total permanent improvements		1,898.72
Total permanent investments		$22,469.52
Operating equipment:		
Livestock—5 horses	$ 875.00	
Machinery and tools	1,873.00	
Horse equipment—harness, etc.	132.00	
Feeds—hay $35; straw $75; corn $150; oats $50; potatoes $50; mill feed $10	370.00	
Seeds—soybeans $68; alsike $2; timothy $4; peas $6; rye $7; sweet clover $12	99.00	
Dairy equipment:		
Trailer $40; separator $70; cooler $22; cans and tinware $39; sundries $20	191.00	
		3,540.00
Sundry supplies:		
Fertilizer $68; limestone $45; gravel $2; coal $3; gasoline $5; oil $5; tile $2; binder twine $2; tape $2	134.00	
		3,674.00
Total investment		$26,143.52

FINANCIAL SUMMARY

Inventory of Permanent Investment Costs and Operating Equipment

March 1, 1918

Land: Original cost including buildings		$15,388.00
Permanent improvement to date		*
Total permanent investment		
Operating equipment:		
Livestock—5 horses $850; 8 cattle $300	$1,150.00	
Machinery, tools and harness	1,798.00	
Crops, feeds, etc.—corn $100; silage $250; oats $90; straw $75; alfalfa $25; hay $400; potatoes $200; mill feed $35	995.00	
Seeds—soybeans $30; rye $40; red clover $22; alsike $6; peas $10; timothy $2; sweet clover $12; beans $5	127.00	
Fertilizer, etc.	50.00	
Building material—gravel $20	20.00	
Sundries—bags $8; oil $20; tile $2; binder twine $2	32.00	
		4,172.00
Total investment exclusive of permanent improvements		$19,560.00

*Data not available.

THE AGRICULTURE OF TRUMBULL COUNTY*

Location.—Trumbull County is on the eastern boundary of the State, with but one county between it and Lake Erie. Bounded on the north by Ashtabula County; on the east by Mercer County, Pennsylvania; on the south by Mahoning County, and on the west by Portage and Geauga Counties.

Geology.—The investigations of the State Geological Survey indicate that Trumbull County was once uniformly covered with the rocks and coal beds of the coal measures, but that these surface rocks have been largely removed by the excavating agencies of the glacial periods, and the basin thus formed filled with the mixture of gravel, sand and clay, known as glacial drift.

Topography.—The surface of a large part of the county is gently undulating, with considerable areas of level to flat land, especially in the northern part of the county, and smaller areas of steep hillsides along the borders of the streams. The principal drainage channels are several creeks which come into the county from the south to form the Mahoning near Warren; Mosquito creek, rising in Ashtabula County and flowing southwardly through the middle of Trumbull County into the Mahoning between Warren and Niles; the upper waters of Grand River, flowing northwardly from the northwestern corner of the county into the Lake, and Pymatuning creek, flowing southwardly near the eastern border of the county.

Soils.—The material fed into the glacial mill, to be ground up and distributed over the surface of Trumbull County as the basis of its soil, has been the sandstones, conglomerate and shales of the coal measures and the rocks immediately underlying the coal, and the resultant soils have been a series varying from sandy ridges to flat stretches of heavy clay, the whole, however, possessing the characteristics of lime deficiency common to the Volusia type. Over much of the county there is great need of underdrainage. When the forest was first cleared away the decaying tree roots formed channels through which the excess of water escaped to lower levels, but these channels have long since been obliterated by the plow sole. When first brought under cultivation there was a sufficiency of lime in the soil for immediate needs, but no reserve upon which to draw as in the case with soils lying over limestones or those into whose composition limestone detritus has entered largely, as in

*From Bulletin 326, "The Agriculture of Ohio."

western Ohio, and consequently the time has come when lime must be supplied artificially if maximum crop production is to be maintained.

Agriculture.—The statistics of crops and livestock show that about half the land of the county is kept in meadows, but the area reported as in clover is relatively very small and decreasing, a condition to be expected on soils of this character when the original supply of lime is exhausted.

The general yield of crops seems to have culminated before the end of the last century, with a downward tendency since.

THE MAINTENANCE OF SOIL FERTILITY

DEPARTMENT OF SOILS

A 4-year rotation of corn, oats, wheat and clover was begun on this farm in 1915, corn being grown that year, both oats and wheat in 1916, and all four crops in 1917. The corn crop of 1916 was frosted September 19, and was cut for silage, so that the tables following include only two crops of corn.

The plan of this experiment is shown in Table 66, and the results for the 3 years, 1915, 1916 and 1917 in Tables 67 to 70.

In Table 71 is shown the apparent financial outcome of this work for the 3 years, using the present approximate valuations of $1 a bushel for corn, 80 cents for oats, $2 for wheat, $20 a ton for hay, $3.50 for limestone, $24 for acid phosphate, 25 cents a pound for muriate of potash, 5 cents for nitrate of soda, and 75 cents a ton for manure.

In considering this table it must be remembered that not all the crops have as yet come under the full course of treatment; that the drainage of the land has not yet had time to become fully effective, and that the irregularities due to previous treatment must affect the outcome for some time to come, so that the results indicated can only be taken in a very general way, and as likely to be considerably modified as the work progresses.

The figures leave no room for doubt that acid phosphate and limestone have returned a very large profit, whether used separately or as supplements to manure. At normal prices muriate of potash would have materially increased the profit, but under the conditions of the present market the profit disappears. Nitrogen, in nitrate of soda, has not justified its extra cost, and the commercial 2-8-2 mixture has shown decidedly less profit than the home mixture used on Plot 5.

The 2-8-2 formula, by the way, has so completely disappeared from the fertilizer market that in making up the fertilizer for Plots 6 and 29 for 1918 we have had to purchase a 1-8-1 and reinforce it with nitrogen and potash.

TABLE 66.—Plan of fertilizing, Trumbull County Experiment Farm

Pounds of fertilizing materials per acre for each crop

	On corn				On oats			On wheat			
	Acid phosphate	Muriate potash	Nitrate soda	Stall manure	Acid phosphate	Muriate potash	Nitrate soda	Acid phosphate	Muriate potash	Nitrate soda	Stall manure
Basal treatment: Finely ground limestone over all, 2 tons per acre on corn											
1											
2	200				100			200			
3	200	15			100	10		200	15		
4											
5	200	15	44		100	10	22	200	15	44	
6	*400				*200			*400			
7											
8	375	80	260					375	80	160	
9				†4 T.							†4 T.
10											
11				†8 T.	100			‡	40	60	
12		40		†4 T.					40		†4 T.
13											
14				§4 T.							§4 T.
Basal treatment: Stall manure phosphated, 60 lb. acid phosphate per ton, 4 tons per acre on corn and wheat											
15	Fine limestone, 1 ton each on corn and wheat										
16	None										
17	Fine limestone, 2 tons on wheat										
18	Coarse limestone, 4 tons on corn, alternate rotations										
19	None										
20	Quicklime, 1 ton on corn										
21	Quicklime, 1 ton on wheat										
22	None										
23	Hydrated lime, 1 ton on corn										
24	Hydrated lime, 1 ton on wheat										
25	None										
No basal treatment											
26	200			§4 T.	100			200			§4 T.
27	200				100			200			
28											
29	*400				*200			*400			

*Commercial 2-8-2.
†Manure phosphated, 60 lb. acid phosphate per ton of manure.
‡200 lb. steamed bonemeal.
§Manure untreated.

In recent quotations on fertilizers we find 1-8-1 listed at $30 to $32.50 a ton, acid phosphate at $21.50 in carloads, or $22.50 to $24 at retail, and nitrate of soda at 5 to 5½ cents a pound. A 1-8-1 fertilizer would contain in a ton half as much phosphorus as a ton of 16-percent acid phosphate. Computing this at the retail price of $24 a ton would mean a cost of $12 for the phosphorus in a ton of the mixture, and would therefore leave $18 to $20 as the cost of

TABLE 67—Fertilizers, lime and manure on CORN, in rotation with oats, wheat and clover, Trumbull County Experiment Farm. Yield and increase per acre

Plot No.	Treatment per acre on corn (Plots 1 to 14, fine limestone over all, 2 tons per acre) (Plots 15 to 25, stall manure phosphated over all 4 tons per acre)	1915—Block A				1917—Block C				2-year Average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	32.57	2,100			30.36	2,400			31.46	2,250			1
2	Acid phosphate, 200 lb	37.86	3,000	3.67	633	28.00	2,050	2 83	—17	32.93	2,525	3.25	308	2
3	Acid phosphate, 200 lb.; muriate potash, 15 lb	40.00	2,750	4.19	117	28.50	1,950	8.52	217	34.25	2,350	6.35	167	3
4	None	37.43	2,900			14.79	1,400			26.11	2,150			4
5	Acid phos., 200 lb.; mur. potash, 15 lb.; nitrate soda, 44 lb.	37.86	2,850	1.38	133	19.07	1,800	3.59	267	28.46	2,325	2.48	200	5
6	Commercial 2-8-2, 400 lb	42.14	2,800	6.62	267	19.86	1,800	3.69	133	31.00	2,300	5.15	200	6
7	None	34.57	2,350			16.86	1,800			25.71	2,175			7
8	Acid phos., 375 lb.; mur. potash, 80 lb.; nit. soda, 260 lb.	44.57	3,250	10.33	900	33.64	2,550	13.52	533	39.10	2,900	11.92	716	8
9	Stall manure, phosphated, 4 tons	38.57	2,750	4.67	400	36.64	2,800	13.26	567	37.60	2,775	8.96	483	9
10	None	33.57	2,350			26.64	2,450			30.10	2,400			10
11	Stall manure phosphated, 8 tons	40.64	2,950	7.71	583	43.43	3,300	19.27	1,017	42.03	3,125	13.49	800	11
12	Stall manure phosphated, 4 tons; mur. potash, 40 lb	33.64	2,450	1.36	67	33.37	3,000	11.68	883	33.50	2,725	6.52	475	12
13	None	31.64	2,400			19.21	1,950			25.42	2,175			13
14	Stall manure untreated, 4 tons	29.93	2,200	—1.71	—200	26.64	1 900	7.43	—50	28.28	2 050	2.86	—125	14
15	Limestone fine, 1 ton	23.57	2,300	—4.93	—150	31.29	3,250	12.29	700	27.43	2,775	3.68	275	15
16	None	28.50	2,450			19.00	2,550			23.75	2,500			16
17	(Limestone on wheat)	27.86	2,250			11.71	2,200			19.78	2,225			17
18	Coarse limestone, 4 tons*	30.36	2,480	1.24	130	10.57	1,450	—4.62	—567	20.46	1,965	—1.70	—218	18
19	None	29.43	2,300			13.29	1,750			21.36	2,025			19
20	Caustic lime, 1 ton	26.29	2,300	—1.43	167	20.57	2,343	7.61	533	23.43	2,325	3.09	350	20
21	(Caustic lime on wheat)	23.29	2,050			10.29	1,350			16.79	1,700			21
22	None	24.29	1,800			12.29	1,950			18.29	1,875			22
23	Hydrated lime, 1 ton	23.57	2,150	— .27	217	31.43	2,350	20.21	417	27.50	2,250	9.97	317	23
24	(Hydrated lime on wheat)	17.43	1,800			15.71	2,400			16.57	2,100			24
25	None	22.93	2,200			9.07	1,900			16.00	2,050			25
26	Untreated manure, 4 tons; acid phosphate, 200 lb	25.43	1,600	2.50	—600	15.64	1,900	8.31	267	20.53	1,750	5.40	—166	26
27	Acid phosphate, 200 lb	27.86	1,800	11.97	200	12.36	1,750	6.77	383	20.11	1,775	9.37	291	27
28	None	15.89	1,600			3.85	1,100			9.87	1,350			28
29	Commercial 2-8-2, 400 lb	32.57	1,700	16.68	100	7.00	1,650	3.15	550	19.78	1,675	9.91	325	29
	Average yield of checks 1, 4, 7, 10, 13	33.96	2,420			21.57	2,000			27.76	2,230			
	Average yield of checks 16, 19, 22, 25	26.29	2,187			13.41	2 037			19.85	2,112			

*On corn, alternate rotations.

TABLE 68.—Fertilizers, lime and manure on OATS in rotation with corn, wheat and clover, Trumbull County Experiment Farm. Yield and increase per acre

Plot	Treatment per acre on oats	1916—Block A				1917—Block D				2-year average				Plot
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	36.56	3,080			47.65	4,385			42.10	3,732			1
2	Acid phosphate, 100 lb	38.12	2,080	1.56	—1,000	45.31	3,750	— .73	—517	41.71	2,915	.41	—750	2
3	Acid phosphate, 100 lb.; muriate potash, 10 lb	40.31	3,810	3.75	730	50.94	3,470	6.52	—678	45.62	3,640	5.13	26	3
4	None	36.56	3,080			42.81	4,030			39.68	3,555			4
5	Acid phos., 100 lb.; mur. potash, 10 lb.; nitrate soda, 22 lb.	43.75	2,750	7.14	— 45	56.25	3,050	11.10	—872	50.00	2,900	9.12	—458	5
6	Commercial 2-8-2, 200 lb	43.28	2,165	6.61	— 345	58.12	3,390	10.62	—423	50.70	2,777	8.61	—384	6
7	None	36.72	2,225			49.84	3,705			43.28	2,965			7
8	(Fertilizer only on corn and wheat)	40.78	2,595	3.23	513	50.62	3,680	— .31	—190	45.70	3,137	1.46	161	8
9	(Phosphated manure on corn and wheat)	43 28	2,465	4.96	527	61.87	4,070	9.84	35	52.57	3,267	7.37	281	9
10	None	39.21	1,795			53.12	4,200			46.16	2,997			10
11	Acid phosphate, 100 lb. (phosphated manure on corn)	42.50	2,340	4.64	552	65.16	3,915	14.02	—782	53.83	3,127	9.33	—115	11
12	(Phosphated manure on corn and wheat)	42.19	2,600	5.68	818	60.00	5,180	10.83	— 13	51.10	3,890	8.25	402	12
13	None	35.16	1,775			47.19	5,690			41.17	3,732			13
14	(Untreated manure on corn and wheat)	40.94	1,890	5.78	115	37.81	6,090	—9.38	400	39.37	3,990	—1.50	257	14
15	(Fine limestone on corn)	37.81	2,090	.12	— 220	51.87	4,340	.93	170	44.84	3,215	.77	— 25	15
16	None	37.19	2,310			50.94	4,170			44.06	3,240			16
17	(Fine limestone on wheat)	36.25	1,840			49.69	4,360			42.97	3,100			17
18	(Coarse limestone on corn)	37.66	1,745	—.26	— 475	44.69	5,670	—3.44	943	41.17	3,707	—1.85	234	18
19	None	38.28	2,175			46.72	5,005			42.50	3,590			19
20	(Caustic lime on corn)	37.03	2,165	.16	295	53.75	4,180	7.55	—625	45.39	3,172	3.85	—165	20
21	(Caustic lime on wheat)	35.94	2,150			45.62	4,240			40.78	3,195			21
22	None	34 06	1,260			45.16	4,405			39.61	2,832			22
23	(Hydrated lime on corn)	36.56	2,080	2.34	708	55.62	3,920	9.16	—610	46.09	3,000	5.75	49	23
24	(Hydrated lime on wheat)	34.22	1,805			47.66	4,925			40.94	3,365			24
25	None	34.53	1,595			49.06	4,780			41.79	3,187			25
26	Acid phos., 100 lb. (untreated manure on corn and wheat)	34.84	1,585	.31	— 10	53.12	4,425	4.06	—355	43.96	3,005	2.18	—182	26
27	Acid phosphate, 100 lb	36.41	2,235	3.29	445	47.66	4,350	2.35	50	42.03	3,292	2.82	247	27
28	None	33.12	1,790			45.31	4,300			39.21	3,045			28
29	Commercial 2-8-2, 200 lb	37.19	2,160	4.07	3.70	45.70	4,600	.39	300	41.44	3,380	2.23	335	29
	Average yield of checks 1, 7, 10, 13	36.84	2,391			48.12	4,402			42.48	3,396			
	Average yield of checks 16, 19, 22, 25	36.01	1,835			47.97	4,590			41.99	3,212			

TABDE 69—Fertilizers, lime and manure on WHEAT in rotation with corn, oats and clover, Trumbull County Experiment Farm
Yield and increase per acre

Plot No.	Treatment per acre, on wheat	1916—Block B				1917—Block A				2-year average				Plot No.
		Yield		Increase		Yield		Increase		Yield		Increase		
		Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw	
		Bu.	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	*Bu.*	*Lb.*	
1	None	19.33	2,690			35.00	3,000			27.16	2,545			1
2	Acid phosphate, 200 lb	32.67	2,490	11.12	167	44.00	3,610	9.81	562	38.33	3,050	10.46	364	2
3	Acid phosphate, 200 lb.; muriate potash, 15 lb	36.67	3,950	12.89	1,393	43.33	3,300	9.94	203	40.00	3,625	11.41	798	3
4	None	26.00	2,790			32.58	3,145			29.29	2,967			4
5	Acid phos. 200 lb.; mur.; potash, 15 lb.; nitrate soda, 44 lb	31.75	3,595	7.19	1,138	45.08	3,640	13.05	653	38.41	3,620	10.12	895	5
6	Commercial 2-8-2, 400 lb	17.00	2,030	—6.11	—93	43.58	3,730	12.11	897	30.29	2,882	3.00	402	6
7	None	21.67	1,790			30.92	2,680			26.29	2,237			7
8	Acid phos., 375 lb.; mur. potash, 80 lb.; nit. soda, 260 lb.;	29.75	3,215	6.47	1,285	50.17	4,390	19.72	1,857	39.96	3,802	13.09	1,571	8
9	Stall manure phosphated, 4 tons	28.50	3,290	3.61	1,220	41.67	3,300	11.70	918	35.08	3,295	7.65	1,069	9
10	None	26.50	2,210			29.50	2,230			28.00	2,220			10
11	Acid phos. 100 lb steamed bonemeal 200 lb. mur. potash, 40 lb.; nitrate soda, 60 lb.*	19.42	2,285	—3.77	27	41.00	3,140	11.78	843	30.21	2 712	4.00	435	11
12	Stall manure phosphated*	24.17	2,800	4.28	493	39.17	2,950	10.22	587	31.67	2,875	7.25	540	12
13	None	16.58	2,355			28.67	2,430			22.62	2,392			13
14	Stall manure, untreated, 4 tons	17.50	4,350	.92	1,995	35.50	2,520	6.83	90	26.50	3,435	3.87	1 055	14
15	(Fine limeston, 1 ton, on corn and wheat)	24.33	2,840	3.91	565	33.08	3,015	.16	690	28.70	2,627	2.03	627	15
16	None	20.42	2,275			32.92	2,325			26.67	2,300			16
17	Fine limestone, 1 ton, on wheat	18.00	2,220	—4.45	—400	35.00	2,400	2.58	78	26.50	2,310	—93	—161	17
18	(Coarse limestone, 4 tons, on corn, alternate rotations)	26.42	3,415			31.67	2,450	—.25	102	29.04	2,932			18
19	None	26.50	3,310			31.42	2,315			28.96	2,812			19
20	(Coarse lime, 1 ton, on corn)	22.67	2,440			36.33	2,720	6.66	617	29.50	2,580			20
21	Crushed lime, 1 ton, on wheat	22.17	2,920	—2.11	—57	32.33	2,560	4.41	668	27.25	2,740	1.15	305	21
22	None	23.17	2,810			26.17	1,680			24.67	2,245			22
23	(Hydrated lime, 1 ton. on corn)	21.33	2,420			36.83	2,540	9.27	643	29.08	2,480			23
24	Hydrated lime, 1 ton, on wheat	22.00	2,430	—1.17	380	30.17	2,090	1.23	—23	26.08	2,260	.03	178	24
25	None	32.33‡	3,610			30.33	2,330							25
26	Acid phosphate, 200 lb.; untreated manure, 4 tons	24.33	2,790	12.16	1,620	36.50	2,560	12.50	950	30.41	2,675	12.33	1 285	26
27	Acid phosphate, 200 lb	16.67	1,650	4.50	480	42.08	3,175	18.08	1,565	29.37	2,412	11.29	10.22	27
28	None	12.17	1,170			24.00	1,610	22.92		18.08	1,390			28
29	Commercial 2-8-2, 400 lb	25.17	2,640	13.00	1,470	46.92	3,435		1,825	36.04	3 037	17.96	1 647	29
	Average of checks 1, 4, 7, 10, 13	22.02	2,247			31.33	2,698			26.67	2,472			
	Average of checks 16, 19, 22	23.36	2,798			30.21	2,162			26.77	2,452			

*All phosphated manure has 60 lb. acid phosphate to the ton of manure. †Phosphated manure, 8 tons on corn.
‡The yield of Plot 25, Block B, is discarded as evidently abnormal, due to treatment before experiment was begun.

the 1 percent, or 20 pounds each of ammonia and potash. Nitrate of soda contains the equivalent of nearly 19 percent ammonia, so that 110 pounds of nitrate of soda will carry as much ammonia as 1,000 pounds of 1-8-1 fertilizer. At 5½ cents a pound, to cover cost and freight, this quantity would cost $6.60, leaving $11.40 to $13.40 as the cost of the 20 pounds of potash, which would be carried in 40 pounds of muriate of potash. Deducting $1 for cost of mixing, the cost of the potash in this formula would therefore be at the rate of 52 to 62 cents a pound for actual potash, equivalent to $520 to $620 a ton for muriate of potash. Recent quotations for this salt in trade journals have been $350 to $500 a ton. On this basis the cost of a 2-8-2 formula would be at the rate of $48 or more a ton, or $24 for the quantity used on Plot 6 in this experiment.

TABLE 70.—Residual effect on CLOVER of fertilizers, lime and manure applied to preceding crops in rotation of corn, oats, wheat and clover
Trumbull County Experiment Farm

Plot	Total treatment per acre for one rotation	Clover—1917 Block B	
		Yield	Increase
		Lb.	*Lb.*
1	None	2,720	.....
2	Acid phosphate, 500 lb	2,836	83
3	Acid phos., 500 lb.; muriate potash, 40 lb	3,209	424
4	None	2,818	.....
5	Acid phos., 500 lb.; mur. potash, 40 lb.; nitrate soda, 110 lb	3,387	525
6	Commercial 2-8-2, 1,000 lb	3,369	462
7	None	2,951	.....
8	Acid phos., 750 lb.; mur. potash, 160 lb.; nitrate soda, 520 lb	3,502	693
9	Stall manure, phosphated, 8 tons	3,236	570
10	None	2,524	.....
11	Stall manure, phosphated, 8 tons; acid phos., 100 lb.; steamed bonemeal, 200 lb.; mur. potash, 40 lb.; nitrate soda, 60 lb	2,818	338
12	Stall manure, phosphated, 8 tons; muriate potash, 40 lb	3,449	1,014
13	None	2,391	.....
14	Stall manure, untreated, 8 tons	2,631	240
15	Fine limestone, 1 ton each oncorn and wheat	3,040	409
16	None	2,631	.....
17	Fine limestone, 2 tons on wheat	2,764	20
18	Coarse limestone, 4 tons on corn, alternate rotations	3,209	.....
19	None	2,969	.....
20	Caustic lime, 1 ton on corn	2,853	.....
21	Caustic lime, 1 ton on wheat	3,716	741
22	None	2,978	.....
23	Hydrated lime, 1 ton on corn	2,933	.....
24	Hydrated lime, 1 ton on wheat	3,449	471
25	None	*3,653	.....
26	Acid phos., 500 lb.; untreated manure, 8 tons	2,739	—916
27	Acid phos., 500 lb.	1,911	98
28	None	1,813	.....
29	Commercial 2-8-2, 1,000 lb	2,498	685
	Average of checks 1, 4, 7, 10, 13	2,681	.....
	Average of checks 16, 19, 22	2,859	.....

*The yield of Plot 25 is discarded, as evidently abnormal, due to previous treatment.

TABLE 71.—Fertilizers, lime and manure in 4-year rotation of corn, oats, wheat and clover, Trumbull County Experiment Farm
General summary, all calculated to one rotation of 4 years

Treatment per acre	Plots	Low values				High values			
		Total value of produce	Total cost of treatment	Net value of produce	Apparent net gain from treatment	Total value of produce	Total cost of treatment	Net value of produce	Apparent net gain from treatment
		Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
None	28	47 75	.....	47.75	.....	95.50	.....	95.50	.....
Acid phos., 500 lb.	27	65.78	4.00	61.78	14.03	131.56	6.00	125.56	30.06
Limestone, 2 tons	1, 4, 7, 10, 13	70.94	6 00	64 94	17.19	141.88	7.00	134.88	39.38
Acid phos., 500 lb.; limestone, 2 tons	2	85 65	10.00	75 65	27.90	171.30	13 00	158.30	62.80
Acid phos., 500 lb.; muriate potash, 40 lb.; limestone, 2 tons	3	91.41	11.00	80.41	32.66	182.82	23 00	159.82	64.32
Acid phos., 500 lb.; mur. potash, 40 lb.; limestone, 2 tons; nitrate soda, 110 lb	5	89.57	14.30	75.27	27.52	179.14	29.60	149.54	54.04
Commercial 2-8-2, 1,000 lb.; limestone, 2 tons	6	82.91	19.00	63.91	16.16	165 82	31.00	134.82	39.32
Commercial 2-8-2, 1,000 lb. (no limestone)	29	75.00	13.00	62.00	14.25	150.00	24.00	126.00	30.50
Untreated manure, 8 tons; limestone, 2 tons	14	69 54	10 00	59.54	11.79	139.08	13.00	126.08	30.58
Phosphated manure, 8 tons; limestone, 2 tons	9, 15	83.32	14.00	69.32	21.57	166.64	18 76	147 88	52.38
Phosphated manure, 8 tons; quicklime, 1 ton	20	73.62	14.00	59.62	11.87	147.24	18.76	128 48	32.98
Phosphated manure, 8 tons; hydrated lime, 1 ton	28	75.92	14.00	61.92	14.17	151 84	18 76	133 08	37.58
Phosphated manure, 8 tons; no lime nor limestone	16, 19, 22, 25	67.91	8 00	59.91	12 16	135.82	11.76	124.06	28.56
Untreated manure, 8 tons; acid phos., 500 lb.	26	71.89	8.00	63.89	16.14	143.78	12.00	131.78	36.28

Low values: Corn, 50c; soybeans, $2; wheat, $1 per bu.; hay, $10 per ton. Acid phosphate, $16 per ton; muriate of potash, 2½c per lb.; nitrate of soda, 3c per lb.; ground limestone, $3 per ton; manure, 50c per ton.

High values: Corn, $1; soybeans, $4; wheat, $2 per bu. Acid phosphate, $24 per ton; muriate of potash, 25c per lb.; nitrate of soda, 5c per lb.; ground limestone, $3.50 per ton; manure, 75c per ton.

Considering Table 71 in detail, it appears that at this stage of the work there has been a total produce on 4 acres of land treated with 500 pounds of acid phosphate worth $131.56 at present prices (Plot 2); when 480 pounds of acid phosphate has been mixed with 8 tons of manure, without lime or limestone (Plots 16, 19, 22, 25) the yield has been but $4 greater than from acid phosphate alone, thus giving but 50 cents a ton for the manure. When, however, 500 pounds of acid phosphate and 8 tons of manure have been applied separately, the acid phosphate being divided between the three grain crops, the value has been increased to $143.78 (Plot 26).

Two tons of ground limestone has produced a yield worth $10 more than that from 500 pounds of acid phosphate, and when the limestone and acid phosphate have both been applied to the same land (not mixed, but applied separately) the net gain, as shown in column 4, has been nearly doubled.

Muriate of potash has apparently paid for itself, with a margin to spare, even at its present extravagant cost, but nitrate of soda has seemingly been used at a loss.

Five hundred pounds of acid phosphate with 2 tons of limestone has apparently produced a yield equivalent to that of 1,000 pounds of 2-8-2 fertilizer with the same amount of limestone. When used without the limestone the 1,000 pounds of mixed fertilizer, which should contain the same quantity of phosphorus as the 500 pounds of acid phosphate, together with 40 pounds of ammonia and potash, has produced a larger total value of crop by nearly $20, and a larger net value by 44 cents, the farmer's share in the profit having disappeared.

Two tons of raw limestone has produced a greater total value than one ton of quicklime or of hydrated lime in this first crop, so that the raw stone has not been slower in action, as many suppose it to be.

The low effect from the first application of manure is not an unusual occurrence, but experience leads us to expect a larger effect when the treatment is repeated, the action of manure being generally slow as compared with that of chemical fertilizers. However, 8 tons of manure reinforced with 480 pounds of acid phosphate and 2 tons of limestone has in these first crops produced as great a yield as 1,000 pounds of mixed fertilizer with 2 tons of limestone.

COMPARISON OF VARIETIES

DEPARTMENT OF AGRONOMY

CORN

The variety test of corn grown for grain in 1916 was killed by frost long before maturity and the corn was accordingly put in the silo. The tests for 1915 and 1917 are reported in Table 72.

TABLE 72: Comparison of varieties of CORN, Trumbull County Experiment Farm

Variety	Yield per acre		
	1917	1915	
	Grain *Bu.*	Grain *Bu.*	Stover *Lb.*
Swisher's White	.....	30.02	2,561
Yellow Dent (Local)	.....	22.75	1,894
Leaming (Frost)	93.44	40.63	5,116
Leaming (Wooster)	.....	46.68	3,465
Ohio 84	94.59	44.97	4,069
Medina Pride	90.01	45.88	4,407
White cap	83.88	40.39	4,879
Darke County Mammoth	.....	34.33	4,950
Flint	53.34	42.05	3,451
Clarage (Av.)	89.56	.....	4,375
Van Wye's Yellow	95.37	.....	3,431
Norton's Dent	70.40	.....	3,600
York's Yellow Dent	87.44	.....	5,023
Golden Glow	81.47	.....	4,522
Minnesota No. 13	81.86	.....	6,120
Ohio 74	73.14	.....	4,691
Pride of the North	77.04	.....	5,344
Stone's Calico	70.84	.....	3,094
Silver King	77.34	.....	4,230
Leetonia Pride	*50.67	.....	3,229
Improved Sabin	*63.86	.....	3,409

Silage Corn	1916	1915	Average
Clarage	8.29	6.04	7.16
Leaming (Frost	9.51	6.80	8.15
Darke County Mammoth	10.07	7.87	8.97
Reid's Yellow Dent	9.69	7.49	8.59
Old Virginia	11.82	8.95	10.38
Eureka	11.26	10.37	10.81
Blue Ridge	11.12	8.80	9.96

*Not as good stand as others.

Seven varieties of corn were tested for silage uses, including the common sorts grown for grain and the large southern varieties. In 1915 the yields ranged from 6.04 tons per acre to 10.37, and in 1916 from 8.29 tons to 11.82. Averaging the 2 years' tests, the Eureka leads by a slight margin, with Old Virginia, second, and Blue Ridge, third. Of the varieties tested, 2 would be classed as common grain varieties and their average yield is 7.65 tons per acre.

Two varieties are very late grain varieties, adapted to southern Ohio. Their average yield is 8.78 tons. Three varieties are large southern types often used for silage in northeastern Ohio. Their average yield is 10.38 tons.

OATS

Thirteen varieties of oats have been tested for three seasons, and for comparison, barley, emmer and spring wheat. Averaging the results, Joanette is first in yield, Silver Mine, second, Ohio 6203, third, and Golden Rain, fourth. Oats and emmer are figured at 32 pounds per bushel and barley at 48 pounds. The yield in pounds per acre is thus considerably lower with barley and emmer than with oats. The average yield of the three crops of spring wheat is 14.75 bushels per acre.

TABLE 73—Comparison of varieties of OATS AND WHEAT, Trumbull County Experiment Farm

Variety	Yield of grain per acre—Bushels				
				3-year average	
	1917	1916	1915	Grain	Straw
				Bus.	*Lbs.*
Ohio 7009	60.21	28.37	38.95	42.51	1,280
Burt	69.90	28.85	48.01	48.92	1,697
Ohio 6293	70.94	35.03	43.27	49.75	2,300
Ohio 201	62.19	33.37	46.19	47.25	2 576
Big Four	66.56	31.66	43.48	47.32	2 437
Ohio 6222	68.55	28.99	40.04	45.86	2,603
Silver mine	72.76	33.38	46.87	51.00	2,317
Swedish Select	66.93	26.92	44.48	46.11	2,125
Storm King	66.46	30.62	43.53	46.87	2,590
Joanette	74.69	32.12	47.02	51.28	2,437
Golden Rain	71.62	32.90	43.89	49.47	2,232
White Russian	69.59	27.44	36.29	44.44	2,268
Wideawake	63.02	31.50	44.73	46.42	2,425
Oderbrucker barley*	36.88	13.33	10.42	20.21	1,743
Emmer*	39.06	15.78	22.12	25.65	2,365
Groff spring wheat*	.....	.....	7.50	.....	1,850
Corn Belt	67.92	32.80	.....	.....	2,330
Blue Ribbon Spring wheat	31.08	5.67	.....	.....	1,672

*Variety dirty 1915

WHEAT

Seventeen varieties of wheat were tested in 1916 and 1917. As a 2-year average the Valley is first in yield, Gladden, second, Ohio 9920, third, and Dawson's Golden Chaff, fourth. The Turkey Red, a standard western variety, yields less than one-third as much as the highest yielding variety of 1916.

TABLE 74—Comparison of varieties of WHEAT.
Trumbull County Experiment Farm

Variety	Yield per acre			
	1917 Grain	1916 Grain	2-year average	
			Grain	Straw
	Bus.	*Bus.*	*Bus.*	*Lbs.*
Fultz	44.81	22.39	33.60	2,672
Trumbull	43.18	22.00	32.59	2,900
Poole	45.29	20.42	32.85	2,957
Ohio 9920	48.53	22.22	35.37	2,835
Portage	44.87	21.47	33.17	2,595
Harvest King	.....	21.49	.....	2,250
Red Wave	46.89	17.97	32.43	2,797
Fultz-Mediterranean	47.58	19.50	33.54	2,775
Dawson's Golden Chaff	50.65	17.67	34.16	3,260
American Bronze	46.26	19.63	32.94	3,505
Nigger	40.42	22.39	31.40	2,437
Gladden	47.31	26.43	36.87	3,150
Mediterranean	.....	20.03	.....	2,300
Goens	40.29	18.36	29.32	1,867
Turkey Red	.....	8 62	.....	1,480
Valley	48.53	25.62	37.07	3,087
Velvet Chaff	42.95	19.78	31.36	2,983
Ohio 12127	46.04	.....	.....	3,490
Ohio 9700	44.12	.....	.....	2,730
Red Wonder	43.37	.....	.....	3,125

SOYBEANS

Nine varieties of soybeans have been tested, five of them for three seasons. As a 3-year average, the Ebony is first in yield, Ohio 9100, second, and Elton (formerly called Chestnut), third.

TABLE 75—Comparison of varieties of SOYBEANS:
Trumbull County Experiment Farm

Variety	Color of beans	Yield per acre				
		1917	1916	1915	3-year average	
					Grain	Straw
		Bus.	*Bus.*	*Bus.*	*Bus.*	*Lbs.*
Elton (chestnut)	Yellow	18.45	6.09	18.09	14.21	1,953
Ebony	Black	*20.45	10.10	23.45	18.00	2,157
Ohio 9100	Yellow	24.86	7.43	16.95	16.41	2,016
Ohio 9016	Yellow	14.75	3.44	11.31	9.83	1,969
Ohio 7476	Yellow	.....	.....	14.56	.....	3,990
Ohio 7496	Yellow	.....	4.57	16.38	.....	1,958
Medium Green	Green	20.50	7.76	13.56	13.94	2,237
Manchuria	Yellow	21.67	8.49	.....	.....	1,675
Mongol	Yellow	25.94	5.92	.....	.....	2,021
17268 Ito San	Yellow	29.48	.....	.....	.....	2,229
New Era Cowpeas	.....	failure	.....	.....	.....	.....

*Average 2 plots.

RYE

In a special test two varieties of rye were compared with wheat. In this one test Wisconsin Pedigreed No. 2 showed no superiority over common rye.

It should be stated that the rye is computed at 56 pounds per bushel and wheat at 60 pounds.

TABLE 76—Rate of seeding RYE AND WHEAT.
Trumbull County Experiment Farm

Grain	Rate of seeding	Yield per acre
	Pecks	*Bus.*
		1916
Wheat	8	20.28
Rye, Common	4	20.72
	6	21.43
Rye, Pedigreed	4	19.64
	6	21.07

DATES AND RATES OF SEEDING

OATS

A rate of seeding test with oats from 6 to 14 pecks has been conducted for two seasons. In 1915, 10 pecks per acre led, with 9 pecks, second, and 8 pecks, third. In 1916, 14 pecks gave the largest yield, with 10 pecks, second, and 11 pecks, third. However, if the extra 4 pecks of seed used be subtracted from the yield from 14 pecks the 10-peck seeding is found to be the more profitable rate.

TABLE 77.—OATS: Rate of seeding, Trumbull County Experiment Farm

Rate seeded (pecks)	Yield of grain per acre	
	1916	1915
	Bu.	*Bu.*
Six	29.37	22.19
Seven	.....	24.69
Eight	36.56	28.12
Nine	.....	29.37
Ten	38.75	33.12
Eleven	*38.54	27.72
Twelve	38.12	25.31
Thirteen	.....	23.44
Fourteen	39.68	25.31

*Average 3 plots.

A date of seeding test was conducted in 1916, ranging from May 11 to June 6. The second seeding, or May 18, gave the largest yield, with May 11, second. There was a drop in yield of nearly 40 percent as between seeding May 18 and June 6.

TABLE 78.—OATS: Date of seeding, Trumbull County Experiment Farm

Date seeded	Yield of grain per acre	
	1917	1916
	Bu.	*Bu.*
April 18	62.50	.....
April 28	55.31	.....
May 8	53.44	.....
May 11	.....	34.84
May 18	56.87	41.56
May 25	.....	27.50
June 6	.....	25.00

A similar test was conducted in 1917, in which the earliest seeding led by a good margin.

DATE OF SEEDING WHEAT

A date of seeding test with wheat was conducted in 1916 and 1917. Averaging the 2 tests, the seedings of September 1 and 2 gave the largest yield, with September 22 and 23, second, and September 8 and 9, third.

While early September seeding is indicated, there is no great drop in yield until the latter part of the month. October seeding is quite uncertain.

TABLE 79—WHEAT: Date of seeding, Trumbull County Experiment Farm

Date seeded	Yield per acre; Bushels		
	1917	1916	2-year average
September 1 and 2	50.00	22.00	36.00
September 8 and 9	48.67	19.83	34 25
September 15 and 16	45.47	20.33	32.90
September 22 and 23	47.67	23.33	35 50
October 1 and 2	37.50	15.17	26.33
October 10	18.67	4.17	11.42
October 21	8.50	.....	8.50

Wheat was seeded at rates ranging from 4 to 10 pecks for two seasons. Ten pecks of seed per acre gave slightly the largest total yield, but 7 pecks the largest net yield. Evidently further tests will be needed to determine the proper rate for these conditions.

TABLE 80—WHEAT: Rate of seeding,-Trumbull County Experiment Farm

Rate seeded	Yield per acre; Bushels		
	1917	1916	2-year average
Four pecks	.....	13.50	.....
Six	40.83	19.00	29.91
Seven	48.00	24.67	36.33
Eight	44.67	22.62	33.64
Ten	46.33	27.50	36.91

OATS AND FIELD PEAS

A test of seeding oats and field peas at different rates, and of seeding the oats a week after seeding the peas was made in 1916.

The seeding of the oats and peas together at one operation gave better results than seeding the oats a week later.

When the combined seeding was one-third oats and two-thirds field peas, the yield of forage was less than when the oats equalled or exceeded the field peas in the mixture.

TABLE 81.—OATS and PEAS: Date and rate of seeding

	1916	
	Date of seeding	Yield of hay per acre
		Pounds
4 pecks oats 8 pecks peas	May 11..... May 18.....	3,200
6 pecks oats 6 pecks peas	May 11..... May 11.....	*4,133
8 pecks oats 4 pecks peas	May 11..... May 18.....	3,600
6 pecks oats 6 pecks peas	May 11..... May 18.....	3,600

*Average 3 plots.

RATE OF SEEDING SOYBEANS

Comparisons were made in 1916 of different rates and ways of seeding soybeans for hay. The latter in rows to be cultivated, as compared with solid drilling. When planted in rows for cultivation, 1½ bushels gave the largest yield of hay. When drilled solid, 3 bushels led, but the extra yield of hay will hardly justify the extra investment in seed.

The solid drilling gave the most hay, but such seedings usually carry a large percentage of foxtail and other weeds and are often a failure.

TABLE 82—SOYBEANS: Rate of seeding

Rate per acre	Yield hay per acre
One half bushel (In rows)	1,600
Three fourths bushel	1,486
One bushel	*1,857
One half bushel	2,057
Three fourths bushel (Drilled solid)	2,400
One half bushel	2,500
Three bushels	2,700

*Average 4 plots.

BULLETIN

OF THE

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COUNTY EXPERIMENT FARMS IN OHIO.

PART VII

THE MAHONING COUNTY EXPERIMENT FARM

SECOND AND THIRD ANNUAL REPORTS, FOR 1916 AND 1917

C. W. MONTGOMERY, CHIEF

D. W. GALEHOUSE AND M. O. BUGBY, SUPERINTENDENTS
JOHN FOLLWEILER AND CARL M. RUNKLE, FARM FOREMEN

PERSONNEL

D. W. Galehouse resigned the superintendency of this farm December 1, 1917, and was succeeded by M. O. Bugby, who supervises the work of both the Trumbull and Mahoning County Experiment Farms. In December, 1916, Carl M. Runkle was transferred from Trumbull to the Mahoning County Experiment Farm as foreman, John Follweiler having resigned.

Residence, Mahoning County Experiment Farm

FARM WORK AND IMPROVEMENTS

The work to date has been largely that of tiling and preparing the farm for experimental work. The spring of 1916 was so wet that but few experimental crops were started and the corn was killed by frost before maturity so that no fertility or variety corn data could be obtained. The corn was put into a silo and a carload of beef cattle were purchased and fed during the winter. No farm scales had been erected so that no account could be kept of the gain or loss on the cattle. However, one object sought was accomplished, converting the immature corn and quite a lot of hay into manure that was much needed on the farm.

Some truck crops were planted and sold at apparently a fair profit and this line of work will be enlarged.

The old schoolhouse was moved and fitted up for an office, the residence house was repaired, and new siding was put on a tenant house. Itemized costs of these improvements are not as yet available. The cost of silo and drainage appear below.

A pressed brick silo, 12 feet in diameter by 30 feet high, was built of brick donated for the purpose by the Bessemer Limestone Company of Youngstown. The cost of erection was $356.

9,566 rods of tile drain was put in at the following cost:

Cost of Tile Drainage

Cost of tile (including freight) at	$0.2598	per rod	
Staking	.0011	per rod	
Machine work cutting trenches	.30	per rod	
Hauling	.0574	per rod	
Laying tile	.0287	per rod	
Filling ditches	.022	per rod	
9,566 rods	.669	per rod	= $6,399.65

In the following pages will be found the crop and field work, the receipts and expenses for the years 1915 and 1916 and an inventory of operating equipment, as for March 1, 1917.

MAHONING COUNTY STATISTICS

POPULATION (U. S. Census)

	1860	1870	1880	1890	1900	1910
Total		31,001	42,871	55,979	70,134	116,151
White		30,744	42,419	55,223	69,101	114,046
Negro		257	449	755	1,023	2,083
Foreign born		5,809	8,800	13,135	15,379	33,418
Rural					25,249	28,743
Urban					44,885	87,408

[a] Population, 1910: Youngstown 79,066; East Youngstown 4,972; Struthers 3,370; Sebring 2,104; Lowellville 1,592.

FARMS (U. S. Census)

	1880	1890	1900	1910
Approximate land area, acres				273,280
Land in farms, acres	251,714	237,560	247,976	234,999
Improved land in farms, acres	193,503	185,748	175,213	164,638
Woodland in farms, acres	54,401	} 51,812	72,763	{ 34,211
Other unimproved land in farms, acres	3,810	}		{ 36,150
Total number of farms, number	2,842	2,794	3,034	3,024
Area of average farm, acres	88.6	85.0	81 7	77.7
Improved land per farm, acres	68.1	66.5	57.7	54.4
Value of all property per farm, dollars	5,697	4,812	4,194	6,305
Value of land and buildings per farm, dollars	5,147	4,168	3,591	5,496
Value of land and buildings per acre, dollars	58.09	49.04	43.95	70.60

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses	7,481	7,829	7,845	8,235	8,965	5,835
Cattle	21,275	19,298	19,793	19,912	16,280	16,175
Sheep	78,923	105,885	66,778	68,722	39,867	16,950
Hogs	12,457	9,580	8,553	8,429	7,889	6,742
Cattle equivalent* Total	37,694	38,673	35,171	35,862	30,030	24,379
Cattle equivalent* Per 1,000 acres			182	193	171	148

FARM CROPS, 10-year average production (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn, acres	11,412	11,046	13,501	13,204	13,714	13,355
Corn, Bushels	350,041	357,056	588,946	402,361	457,752	437,392
Corn, Bushels per acre	30.6	32.5	44.6	30.1	33.3	32.5
Oats, acres	10,605	10,853	13,452	15,012	16,116	15,360
Oats, Bushels	262,493	309,957	373,608	488,384	465,474	526,402
Oats, Bushels per acre	24.7	28.5	27.7	32.5	28.9	34.3
Wheat, acres	13,583	9,270	10,596	14,338	14,990	14,468
Wheat, Bushels	163,787	108,104	134,395	228,459	260,198	232,035
Wheat, Bushels per acre	12.1	11.6	12.7	15.9	17.4	16.1
Rye, acres	1,786	1,000	554	2,562	447	332
Rye, Bushels	9,873	10,098	5,805	28,910	3,961	5,646
Rye, Bushels per acre	5.5	10.1	10.5	11.3	8.8	17.0
Meadows, acres	28,758	30,175	31,640	27,158	28,421	32,974
Meadows, Tons	39,039	36,755	33,333	37,513	39,295	43,477
Meadows, Tons per acre	1.34	1.22	1.05	1.38	1.35	1.32
Clover, acres		4,097	4,236	8,107	4,683	3,224
Clover, Tons		4,956	5,425	10,524	6,481	5,181
Clover, Tons per acre		1.22	1.28	1.30	1.38	1.61
Potatoes, acres		1,029	1,181	1,352	2,419	2,630
Potatoes, Bushels		91,567	112,820	127,415	163,940	258,496
Potatoes, Bushels per acre		89.2	95.6	94.2	68.0	98.3
Orchards, acres		3,940	4,816	4,749	4,611	4,258
Apples, Bushels		106,322	224,340	223,792	136,622	201,973

*Computing 10 sheep or hogs as equivalent to 1 horse or cow for manure production.

CROP AND LABOR STATISTICS OF THE MAHONING COUNTY EXPERIMENT FARM FOR 1916

Area of farm 275 acres
Area cultivated 103.63 acres
Permanent pasture 75.5 acres
Woodland 38 acres
Waste 46.37 acres
Roads (farm) 3.5 acre
Miscellaneous 8 acres

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK		*Acres*		
Oats	27	2.7	2,084 lbs.	24.12 bu.
Barley	1	.1	59 lbs.	12.29 bu.
Emmer	1	.1	67 lbs.	20.94 bu.
Wheat: Spring	1	.1	54 lbs.	9. bu.
Potatoes	12	1.08	3,385 lbs.	52.24 bu.
Cabbage	5	.25	1,238 lbs.	2.47 tons
Not producing in 1916:				
Strawberries	10	.5		
Blocks R, S and T	18	1.8		
Total		6.63		
FIELD WORK				
Corn: silage including plot work		23	285,000 lbs.*	11.95 tons
Oats		6	8,648 lbs.	45.04 bu.
Hay: timothy and clover		48	120,000 lbs.*	1.25 tons
oat		2	4,000 lbs.*	1 ton
soybean		1	1,000 lbs.*	.5 ton
Potatoes		2.5	165 bu.	66 bu.
Sweet corn		.5	144 doz.	288 doz.
Tomatoes		.5	161 bt.	322 bt's
Apples		6.	300 bu.	50 bu.
Area not harvested:				
Sweet corn (Immature fed to stock)		.25		
Orchard		7.25		
Total crop acres		103.63		
Less plot acres		6.63		
Total field acres		97		

*Estimated.

	Oats	Potatoes	Cabbage
	bu.	bu.	tons.
Highest yielding plots per acre:	31.56	129.17	3.54
Lower yielding plots per acre:	10	90.83	1.4

Number work horses used in 1916 4
Total man hours for the year (March 1, to February 28, 1917 inclusive) 12.633
Total horse hours for the year (March 1, 1916 to February 28, 1917 inclusive) 6,297.50
Total tractor hours for the year (March 1, 1916 to February 28, 1917 inclusive) 453.50

CROP AND LABOR STATISTICS OF THE MAHONING COUNTY EXPERIMENT FARM FOR 1917

Area of farm 275 acres
Area cultivated 103.63 acres
Permanent pasture 75.5 acres
Woodland 38 acres
Waste 46.37 acres
Roads (fanm) 3.5 acre
Miscellaneous 8 acres

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK		*Acres*		
Corn	42	4.13	Destroyed by wireworms	
Oats	56	5.6	7,732 lb.	43.15 bu.
Soybeans	52	5.13	2,350 lb.	7.63 bu.
Potatoes	10	.5	2,636 lb.	87.87 bu.
Wheat	66	6.6	10,568 lb.	26.69 bu.
Strawberries	45	.56	2,585 qt.	143.3 bu.
Tomatoes	43	.92	12,682 lb.	246.16 bu.
Cabbage	32	.8	4 351 lb.	5.44 tons
Sweet corn	32	.8	381 doz.	476. doz.
Cucumbers	32	.8	4,249 lb.	2.66 tons
Total plots and plot acres	368	21.71		
FIELD WORK				
Corn		?	No report	
Potatoes		?	No report	
Wheat		14.5	No report	
Rye		9.5	No report	
Hay		?	94,640 lb.	
Apples		?	No report	

	Oats *Bu.*	Soy-beans *Bu.*	Wheat *Bu.*	Pota-toes *Bu.*	Straw-berries *Bu.*	Sweet corn *Doz.*	Cucum-bers *T.*	Toma-toes *T.*	Cab-bage *T.*
Lowest yielding plots per acre	35.31	1.17	7.33	67.5	17.36	80	.1	3.83	1.92
Highest yielding plots per acre	68.92	16.66	42.83	116.67	185.62	733 1-3	6.54	11.34	10.76

Number work horses used on Mahoning County Experiment Farm in 1917.....4
Number man hours per year (March 1, 1917 to February 28, 1918 inclusive).....9,964
Number horse hours per year (March 1, 1917 to February 28, 1918 inclusive).....5,803

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1917

RECEIPTS

From county treasury:		
Balance forward from 1915	$9,683.84	
Appropriations for year 1916	1,839.64	
		$11,523.48
From farm sales:		
Fruit—apples $247.03; miscellaneous $9.75	256.78	
Truck crops—potatoes $36.85; tomatoes $58.71; cabbage $31.40; sweet corn $21.85	148.81	
Miscellaneous—machine rental $40.49; labor $13.16; freight refund $19.95	73.60	
		479.19
Total receipts		$12,002.67

EXPENDITURES

For labor		$2,316.34
For current expense—seeds, etc. $171.93; fertilizer, lime, etc. $154.39; spray materials $29.82; blacksmithing $20.60; painting and repairs $113.40; fuel and light $248.49; power maintenance $59.19; miscellaneous hardware $19.01; containers $29.72; telephone and telegraph $63.50; transportation $424.50; office furniture and supplies $20.00		1,355.45
For machinery and tools		3,029.56
For permanent improvement:		
Buildings	$340.62	
Building material and construction	264.19	
	$604.81	
Water supply	51.24	
Plot work fixtures	25.40	
Tile drains	1,871.48	
Clearing land	27.23	
Fences	268.25	
		2,848.41
For livestock:		
Purchases—cattle $1,193.19; horses $436.50	1,629.69	
Maintenance—feeds $635.35; veterinary, medicine, etc. $7.75; livestock fees $11.50; straw $128.50	783.10	
		2,412.79
Total expenditures		$11,962.55
Balance in county treasury February 28, 1917		40.12
		$12,002.67

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1918

RECEIPTS

From county treasury		$2,000.25
Balance in treasury March 1, 1917		80.54
From farm sales:		
Livestock—cattle	$ 830.00	
Crops—wheat $1,049.50; soybeans $24.50; rye $97.75; hay $278.96; potatoes $679.85; strawberries $222.59; apples $70.35; sweet corn $124.60; tomatoes $532.62; cabbage $59.71; turnips $154.24; oats $75.00; straw $134.81; miscellaneous truck $83.27; pasture $7.80; team and implement hire $5.97....	3,525.32	
		4,355.32
Total receipts		$6,436.11

EXPENDITURES

For labor		$2,102.15
For current expense—seeds $172.58; feeds $458.95; fertilizers $505.71; spray material $32.45; containers $80.59; binding material $37.27; threshing, etc. $107.95; greenhouse maintenance $20.28; implement repairs $36.17; engine maintenance $125.25; horse shoeing, etc. $73.79; veterinary service $5.50; building renewal and repair $103.48; water system maintenance $15.18; office supplies $47.12; communication $48.04; miscellaneous hardware $18.62		1,888.93
For permanent improvements:		
Drainage material	$195.00	
Fence material	119.54	
Building material	20.26	
Concrete material	71.89	
		406.69
For machinery and tools—delivery truck $463.45; general implements $229.35		692.80
Total expenditures		$5,090.57
Balance in treasury February 28, 1918		1,320.54
In hands of superintendent for payment of small bills		25.00
		$6,436.11

FINANCIAL SUMMARY

Inventory of Permanent Investment and Operating Equipment
March 1, 1917

Land—including buildings—(original cost)		$28,000.00
Operating equipment:		
Livestock—5 horses $780; 10 cattle $1,250	$2,030.00	
Machinery and tools—horse equipment $149; general farm machinery $2,316; small tools $486; garden equipment $57; office equipment $41	3,049.00	
Produce, feeds etc.:		
Hay $670; straw $335; corn $16; silage $140; wheat $2; oats $1; potatoes $400; mill feed $21	1,585.00	
Supplies:		
Fertilizer and lime $13; gasoline $6; kerosene and oil $6; barb wire $2; posts $220	247.00	
Total operating equipment		$6,911.00
Total investment exclusive of permanent improvement*		$34,911.00

Inventory of Permanent Investment Costs and Operating Equipment
March 1, 1918

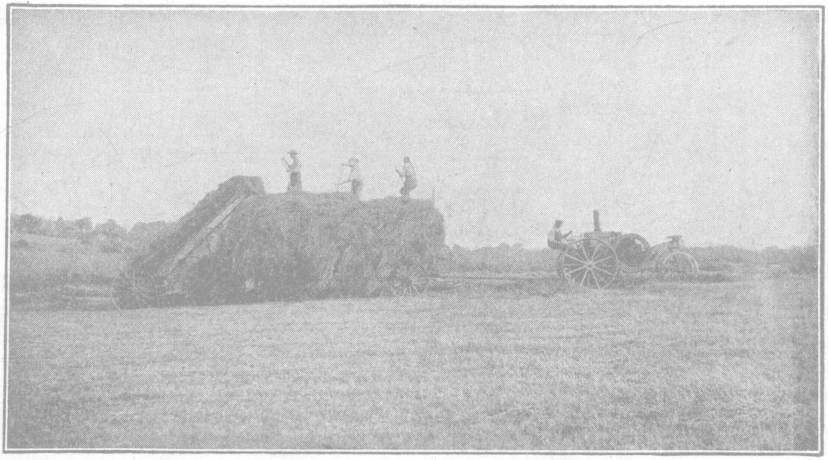
Land: Original cost including buildings		$28,000.00
Operating equipment:		
Livestock—5 horses $805; 1 heifer and 9 steers $1,034;	$1,839.00	
Machinery, tools and harness $3,205; garden equipment $162	3367.00	
Crops—hay $502; straw $250; soybeans $100; corn $180; wheat $483; potatoes $425; mill feed $9; navy beans $45; apples $100	2,094.00	
Seeds—red clover $44; alsike $9; timothy $9; rye $3	65.00	
Fertilizer, etc.	220.00	
Concrete material $50; lumber $20	70.00	
Fence posts	110.00	
Containers	105.00	
Office equipment	39.00	
Sundries—oil and gas $20; binder twine $1; paint $5; spray material $1	27.00	
Total operating equipment		7,936.00
Total investment exclusive of permanent improvement*		$35,936.00

*Data for permanent improvement not completed.

THE AGRICULTURE OF MAHONING COUNTY*

Location.—Mahoning County is bounded on the north by Trumbull County; on the east by Lawrence County, Pennsylvania; on the south by Columbiana County, and on the west by Stark and Portage Counties.

Geology.—The surface rocks of Mahoning County are the sandstones, shales and limestones of the coal measures, which have been covered over with a layer of glacial drift, derived from similar formations in the north.



Loading hay, Mahoning County Experiment Farm

Topography.—The topography of the greater part of this county is gently rolling, with small areas of level land in the western portion. The Mahoning River crosses the northeastern corner of the county in a deep valley, the sides of which are somewhat steep. The drainage of the major part of the county is to the northward, into the Mahoning River, but the southern townships drain southward.

Soils.—The soils of Mahoning County belong to the Volusia and Trumbull series, a type of soils characterized by deficiency in lime, by fine grained, silty texture and light yellow to gray color when dry. The subsoil is so impervious that the land dries slowly, making underdrainage necessary to the most successful cultivation.

Agriculture.—The statistics of crop production show an approximately equal area in the three cereals, corn, oats and wheat, with

*From Bulletin 326, "The Agriculture of Ohio."

more than twice as many acres in meadows and clover as in either of the cereal crops, thus indicating that a more or less systematic rotation of crops is practiced.

The rate of production has averaged nearly 34 bushels of corn and a little more than 29 bushels of oats and 14 bushels of wheat for the 60 years, 1850-1909. Corn does not manifest any decided tendency toward increasing yields. The yield of oats has been a little higher during the latter half of the 60-year period than during the earlier, while the yields of wheat have averaged 16.5 bushels per acre for the last 3 decades as against 12.1 bushels for the first 3, an increase doubtless due in large measure to increasing use of commercial fertilizers, the expenditure for which was insignificant before 1880, but had grown to an annual purchase of 1,500 tons for the ten years, 1900-1909.

With this increase in the purchase of chemical fertilizers, however, there has been a reduction in the livestock of the county equivalent to 11,000 head of cattle, computing 10 sheep or swine as equivalent to one cow or horse in manure production, or enough to have produced 55,000 tons of manure each year during the 6 months of winter feeding; or manure enough to have produced 160,000 bushels of corn, 70,000 bushels of wheat and 5,000 tons of hay, had its use been followed by such increase in crops as has been obtained as a 20-year average at the State Experiment Station.

The fertilizers purchased probably contained about 30,000 pounds each of nitrogen and potash with 240,000 pounds of phosphoric acid, while 55,000 tons of manure should have carried 500,000 pounds each of nitrogen and potash, with 320,000 pounds of phosphoric acid.

THE MAINTENANCE OF SOIL FERTILITY

Three rotations with field crops are in progress on the Mahoning County Experiment Farm, namely:

Rotation I: Corn, oats, wheat and mammoth clover, the clover to be plowed down after saving the seed.

Rotation II: Corn, oats, wheat and medium clover, all crops to be removed.

Rotation III: Corn, soybeans, wheat and clover, all crops to be removed.

All the land in these rotations is dressed with finely ground limestone after being plowed for corn, the limestone being applied over all the land.

TABLE 83—Fertilizers and manure on OATS and SOYBEANS grown in rotation with Corn and Wheat; Mahoning County Experiment Farm, 1917.

Plot No.	Treatment per acre on oats and soybeans	Yield and increase per acre			
		Yield		Increase	
		Grain *Bu.*	Straw *Lb.*	Grain *Bu.*	Straw *Lb.*
Rotation I: Corn-oats-wheat-mammoth clover, Clover plowed under after saving seed. Finely ground limestone 2 tons per acre over all on corn.		Oats, 1917, Block C.			
1	None	49.69	2,910	.....	.....
2	Acid phosphate; 100 lb	55.31	3,130	7.70	220
3	(To have raw phosphate rock on clover)	49.69	2,910	.....	.....
4	None	43.44	2,910	.....	.....
5	Steamed bonemeal, 60 lb	49.69	2,710	5.31	—170
6	Acid phosphate, 100 lb; muriate potash, 10 lb	52.50	2,620	7.19	—230
7	None	46.25	2,820	.....	.....
8	(To have raw phosphate rock on clover)	45.47	2,445	.....	.....
9	Steamed bonemeal, 80 lb.; muriate potash, 10 lb	49.53	3,015	2.55	152
10	None	47.34	2,885	.....	.....
	Average unfertilized yield	46.68	2 881	.....	.....
Rotation II: Corn-oats-wheat-medium clover. All crops removed. Finely ground limestone 2 tons per acre over all on corn.		Oats 1917, Block B			
1	None	47.03	2,095	.....	.....
2	Acid phosphate, 100 lb	56.25	3,100	9.06	843
3	Acid phosphate, 100 lb.; muriate potash, 10 lb	56.09	3,305	8.75	887
4	None	47.50	2,580	.....	.....
5	Acid phos., 100 lb muriate potash, 10 lb nitrate soda, 20 lb.	56.41	3,595	7.50	793
6	(Fertilized on corn and wheat only)	52.81	3,110	2.50	87
7	None	51.72	3,245	.....	.....
8	(Manured and fertilized on corn and wheat only)	56.09	2,905	4.47	—310
9	(Manured on corn alone)	55.62	3,220	4.11	35
10	None	51.41	3 155	.....	.....
	Average yield of unfertilized check plots	49.41	2 769	.....	.....
Ration III: Corn-soybeans-wheat-medium clover. All crops removed., Finely ground limestone 2 tons per acre over all on corn.		Soybeans, 1917, Block L			
1	None	2,800		.....	
2	Acid phosphate, 100 lb	3,000		30	
3	Acid phosphate, 100 lb.; muriate potash, 10 lb	3,400		270	
4	None	3,300		.....	
5	Acid phos., 100 lb.; mur. potash, 10 lb.; nitrate soda, 20 lb.	4,700		1,480	
6	Acid phosphate, 300 lb.; muriate potash, 40 lb	5,200		2,070	
7	None	3,050		.....	
8	Acid phosphate, 180 lb	5,450		2,310	
9	(To be manured and fertilized on corn and wheat only)	5,000		1,920	
10	None	3 300		.....	
	Average yield of unfertilized check plots	3 150		.....	

This work was begun in 1916 by laying off the land and tile draining it, the drainage occupying all of that season and extending over into 1917. Because of hindrance from the drainage work the corn field could not be planted until late in the spring of 1916 and an early frost in the fall prevented it from reaching maturity, hence it was cut for the silo. The corn crop of 1917

was so injured by wireworms that it was abandoned and soybeans were grown instead. Oats, wheat and soybeans were successfully grown in 1917 but so many of the beans were lost before threshing that only the total weight as weighed in the field can be given.

TABLE 84.—Fertilizers and manure on WHEAT grown in rotation with corn, oats or soybeans and clover, Mahoning County Experiment Farm

Plot No.	Treatment per acre on wheat	Yield and increase per acre			
		Yield		Increase	
		Grain *Bu.*	Straw *Lb.*	Grain *Bu.*	Straw *Lb.*
Rotation I: Corn-oats-wheat-mammoth clover. Clover plowed under after saving seed. Finely ground limestone, 2 tons per acre over all on corn. Wheat, 1917, Block B					
1	None	9.58	1 125		
2	Acid phosphate, 200 lb	29.58	2,025	20.30	1,048
3	(To have raw phosphate rock on clover)	7.33	860		
4	None	8.67	680		
5	Steamed bonemeal, 120 lb	27.75	2,335	19.08	1,622
6	Acid phosphate, 200 lb.; muriate potash, 15 lb	31.25	2,225	22.58	1,478
7	None	8.67	780		
8	(To have raw phosphate rock and muriate potash on clover)	7.33	860		
9	Steamed bonemeal, 120 lb.; muriate potash, 15 lb	23.08	1,915	15.19	1,222
10	None	7.50	650		
	Average yield of unfertilized check plots	8.60	809		
Rotation II: Corn-oats-wheat-medium clover. All crops removed. Finely ground limestone, 2 tons per acre over all on corn. Wheat, 1917, Block F					
1	None	16.83	1,190		
2	Acid phosphate, 200 lb	39.92	3,205	24.51	1,963
3	Acid phosphate, 200 lb.; muriate potash, 15 lb	35.58	3,065	21.58	1,772
4	None	12.58	1,345		
5	Acid phos., 200 lb.; mur. potash, 15 lb.; nitrate soda, 45 lb.	36.83	3,090	25.05	1,797
6	Acid phos., 250 lb.; mur. potash, 40 lb.; nitrate soda, 125 lb.	38.00	3,120	27.03	1,878
7	None	10.17	1,190		
8	Acid phosphate, 200 lb. (To be manured on corn)	30.83	2,450	19.63	1,322
9	(To be manured on corn)	12.42	1,455		
10	None	13.25	1,005		
	Average yield of unfertilized check plots	13.21	1,182		
Rotation III: Corn-soybeans-wheat-medium clover. All crops removed. Finely ground limestone, 2 tons per acre over all on corn. Wheat, 1917, Block K					
1	None	13.00	1,820		
2	Acid phosphate, 200 lb	40.25	3,185	24.92	1,305
3	Acid phosphate, 200 lb.; muriate potash, 15 lb	42.83	3,730	25.16	1,790
4	None	20.00	2,000		
5	Acid phos., 200 lb.; mur. potash, 15 lb.; nitrate soda, 45 lb.	38.92	4,165	19.78	2,080
6	Acid phos., 300 lb.; mur. potash, 40 lb.; nitrate soda, 200 lb.	42.67	4,440	24.39	2,270
7	None	17.42	2,255		
8	Acid phosphate, 300 lb. (To be manured on corn)	38.25	3,605	21.30	1,572
9	Acid phos., 200 lb.; steamed bonemeal, 100 lb.; muriate potash, 50 lb. (To have phosphated manure on corn)	37.92	4,075	21.45	2,263
10	None	16.00	1,590		
	Average yield of unfertilized check plots	16.60	1,916		

The wheat shows a remarkable effect from the treatment, the increase in this crop alone being sufficient to cover all the cost of the treatment for the entire rotation in every case except Plot 26, in which the cost of the large dressings of muriate of potash and nitrate of soda, at present high prices for these materials, would outrun the value of the increase. This point is brought out in Table 85, giving the cost of treatment and value of increase on the two scales of values, wheat being rated at $1 a bushel in the low valuations and $2 in the high, and the fertilizing materials as shown below:

	Low	High
Acid phosphate, per ton	$16.00	$ 24.00
Muriate of potash, per ton	50.00	500.00
Nitrate of soda, per ton	60.00	100.00
Untreated manure, per ton	.50	.75
Phosphated manure, per ton	.82	1.23

TABLE 85—Cost of fertilizers for entire rotation and value of increase of wheat in 1917, Mahoning County Experiment Farm:

Rotation No.	Plot No.	Low values		High values	
		Value of increase	Cost of treatment	Value of increase	Cost of treatment
		Dollars	*Dollars*	*Dollars*	*Dollars*
I	2	20.30	4.00	40.60	6.00
	5	19.08	4.00	38.16	6.00
	6	22.58	5.00	45.16	20.00
	9	15.19	5.00	30.38	16.00
II	2	24.51	4.00	49.02	6.00
	3	21.58	5.00	43.16	16.00
	5	25.05	8.30	50.10	21.50
	6	27.03	13.50	54.06	38.50
	8	19.63	4.88	39.26	7.32
III	2	24.92	4.00	49.84	6.00
	3	25.16	5.00	50.32	16.00
	5	19.78	8.30	39.56	21.50
	6	24.39	22.20	48.78	60.80
	8	21.30	8.76	42.60	13.14
	9	21.45	12.20	42.90	26.70

Of course these figures must not be taken as final, but they add to the accumulated weight of evidence in favor of a much more liberal use of phosphorus on eastern Ohio soils than has yet been generally practiced.

FERTILIZING TRUCK CROPS

An experiment in fertilizing truck crops was begun in 1917, duplicating the similar experiment on the Washington County Truck Experiment Farm, but the seasonal conditions were unfavorable and the outcome was so irregular as to yield no reliable information.

FERTILIZERS ON POTATOES

An experiment was begun in 1917 in which potatoes are to be grown in rotation with strawberries, the potatoes to receive the same treatment that is given to this crop in the experiments on the Hamilton and Clermont County Experiment Farms. The results for 1917 are given in Table 86.

TABLE 86.—Fertilizers and manure on POTATOES, Mahoning County Experiment Farm, 1917

Plot	Treatment per acre	Yield per acre	Increase per acre
		Bu.	*Bu.*
1	None	67.50	.....
2	Acid phosphate, 200 lb	93.67	25.45
3	Acid phosphate, 200 lb.; muriate potash, 50 lb	93.00	24.05
4	None	69.67	.....
5	Acid phos., 200 lb.; muriate potash, 50 lb.; nitrate soda, 50 lb	93.33	23.99
6	Acid phos., 400 lb.; muriate potash, 100 lb.; nitrate soda, 100 lb	116.67	47.67
9	None	68.67	.....
10	Manure, 8 tons	96.67	28.00
7	Manure, 8 tons, acid phosphate, 200 lb	111.00	42.33
8	None	68.67	.....
	Average unfertilized yield	68.63	.....

It is evident that in this first crop acid phosphate and manure have given a good account of themselves.

COMPARISON OF VARIETIES

OATS

Sixteen varieties of oats and one variety each of barley, emmer and spring wheat were tested in 1916 and 1917. Averaging the two seasons' tests, Ohio 6222 is first in yield, Ohio 6203, second, Golden Rain, third, Silver Mine, fourth. The yields of straw range from 1,500 pounds per acre with Ohio 7009 to 2,580 pounds with Detmer's New Bumper.

Both Oderbrucker barley and emmer have proved inferior to oats as a spring crop. In 1917 Blue Ribbon spring wheat yielded about one-half as much as good varieties of winter wheat.

A date of seeding test was conducted in 1917. The yields varied but little from the different seedings.

WHEAT

Twenty-one varieties of winter wheat were tested in 1917. The Fultz is first in yield, Gladden, second, Ohio 9920, third, Ohio 12127, fourth.

TABLE 87.—Companison of varieties of OATS, Mahoning County Experiment Farm

Variety	Yield per acre			
	1917	1916	2-year average	
			Grain	Straw
	Bu.	*Bu.*	*Bu.*	*Lb.*
Ohio 7009	37.08	28.75	32.91	1,500
Ohio 8550	49.06	33.02	41.04	1,505
Burt	46.65	26.67	36.66	1,470
Ohio 6203	62.45	30.11	46.28	1,947
Ohio 201	54.78	29.48	42.13	2,553
Ohio 6222	66.50	30.11	48.30	2,077
Big Four	60.83	26.99	43.91	1,707
Silver Mine	56.25	31.67	43.96	2,065
Swedish Select	56.29	21.99	39.14	1,970
Storm King	47.64	21.67	34.65	2,130
Joanette	58.01	27.92	42.96	2,580
Golden Rain	63.12	26.67	44.89	2,092
White Russian	.....	23.02	.....	1,500
Victory	61.86	20.31	41.08	2,115
Corn Belt	54.21	18.13	36.17	2,220
Detmers New Bumper	48.48	23.65	36.06	2,482
Wideawake	54.16	22.61	38.38	2,392
Oderbrucker barley	14.48	12.29	13.38	2,432
Emmer	19.69	20.94	20.31	2,750
Blue Ribbon spring wheat	14.17	9.00	11.58	2,705
Iowa 103	57.38	.....	.....	2,260
Potomac	57.23	.....	.....	3,350

In date of seeding test the seeding made September 8 gave the largest yield, September 16, second, and September 1, third.

TABLE 88—Comparison of varieties of WHEAT
Mahoning County Experiment Farm

Variety	Yield per acre, 1917	
	Grain *Bus.*	Straw *Lbs.*
Fultz	38.56	2,540
Trumbull	34.00	1,980
Ohio 12127	35.69	2,170
Fultz-Mediterranean	28.69	1,935
Poole	28.56	2,045
Portage	31.34	2,235
Ohio 9920	35.91	2,575
Harvest King	31.22	1,715
Red Wave	28.92	2,165
Dawson's Golden Chaff	27.33	2,175
American Bronze	26.97	2,705
St. Louis Grand Prize	28.25	2,095
Gypsy	33.94	2,370
Gladden	36.61	3,010
Ohio 9700	28.44	2,385
Goens	25.36	1,455
Valley	32.69	1,975
Nigger	30.86	2,360
Marvelous	30.44	2,660
Red Wonder	31.19	2,015
Velvet Chaff	27.11	2,003

SOYBEANS

Eight varieties of soybeans were tested in 1917, with the Ebony first in yield, Medium Green, second, and Mongol, third.

TABLE 89—Comparison of varieties of SOYBEANS, Mahoning County Experiment Farm

Variety	Yield per acre 1917	
	Grain *Bus.*	Straw *Lbs.*
Ohio 9100	6.53	1,887
Ohio 9016	1.24	1,304
Elton	3.38	541
Ebony	8.01	901
Manchuria	3.49	276
Ohio 7496	1.60	392
Mongol	6.67	779
Medium Green	7.41	974
New Era Cowpeas		

TABLE 90.—Dates of seeding OATS and WHEAT, Mahoning County Experiment Farm, 1917

Oats			Wheat		
Date of seeding	Yield per acre		Date of eeeding	Yield per acre	
	Grain	Straw		Grain	Straw
	Bu.	*Lb.*		*Bu.*	*Lb.*
April 4	55.62	2,620	September 1	26.67	2,700
April 11	55.47	1,925	September 8	31.00	2,340
April 18	57.19	2,370	September 16	27.50	2,350
April 25	57.19	2,270	September 22	19.00	1,940
May 2	55.00	2,640	September 30	25.17	2,090
May 9	53.44	2,390	October 6	25.00	2,000

THE APPLE ORCHARD

An apple orchard has been planted on the plan shown in Diagrams I and II, the first diagram representing an orchard planted for culture tests and the second one planted for variety comparisons; the two orchards standing side by side, as indicated by the letters. In the culture tests the permanent varieties are planted 40 feet apart each way, with fillers between which are to be taken out when they begin to crowd the permanent trees.

A peach orchard has been planted at the south end of the apple orchard.

APPLE ORCHARD CULTURE TEST PLOTS

PLAN OF EXPERIMENT

Plot 1, Rows A, B, C: Cultivated and inter-cropped. Any crop suitable to be grown in a young orchard to be used. Any suitable fertilizer can be used. The work done must be for the benefit of trees. The crop is incidental.

DIAGRAM I.—MAHONING COUNTY EXPERIMENT FARM—APPLE ORCHARD CULTURE TEST PLOTS

Apples 40 x 20 ft. E / N—S / W * Permanent trees. *Fillers

Row	Variety	Row	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Row
A	* Baldwin * Va. Beauty	A	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	A
B	* McIntosh * Y. Transparent	B	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	B
C	* Mother * Red June	C	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	C
D	* Baldwin * Duchess	D	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	D
E	* Grimes (Top grafted) * Grimes (Ordinary)	E	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	E
F	* Jonathan * Wealthy	F	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	F
G	* Baldwin * Oldenburg	G	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	G
H	* Grimes (Top grafted) * Grimes (Ordinary)	H	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	H
I	* Jonathan * Wealthy	I	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	I
J	* Baldwin * Liveland Raspberry	J	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	J
K	* Sutton * Baltimore	K	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	K
L	* Delicious * Ben Hur	L	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	* *	L

DIAGRAM II.— MAHONING COUNTY EXPERIMENT FARM—VARIETY APPLE PLOTS

Apples 40 x 40 ft.

E
N S
W

Row	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Row
M	*	*	*	*	*	*	*	*	*	*	*	*	*	*	M
N	*	*	*	*	*	*	*	*	*	*	*	*	*	*	N
O	*	*	*	*	*	*	*	*	*	*	*	*	*	*	O
P	*	*	*	*	*	*	*	*	*	*	*	*	*	*	P
Q	*	*	*	*	*	*	*	*	*	*	*	*	*	*	Q
R	*	*	*	*	*	*	*	*	*	*	*	*	*	*	R
S	*	*	*	*	*	*	*	*	*	*	*	*	*	*	S
T	*	*	*	*	*	*	*	*	*	*	*	*	*	*	T
U	*	*	*	*	*	*	*	*	*	*	*	*	*	*	U
V	*	*	*	*	*	*	*	*	*	*	*	*	*	*	V
W	*	*	*	*	*	*	*	*	*	*	*	*	*	*	W
X	*	*	*	*	*	*	*	*	*	*	*	*	*	*	X

Plot 2, Rows D, E, F: Cultivated with cover crop. Such cover crops to be used as may be thought best for the purpose. If found possible to grow any cover crop that can be utilized the proceeds may be credited to the plot.

No fertilizers to be used on this plot. Trees to be mulched first season, not thereafter. No crops other than cover crops shall be raised.

Plot 3, Rows G, H, I: Sod mulched trees to be planted in holes 3 feet across. Trees to be mulched with strawy manure, thereafter with grass that grows on plot. As trees grow, circle of mulch to be increased in size. If sufficient grass does not grow on the plot to make as much mulch as required additional material must be brought in. The grass to be mown once or twice a season as required. If grass is not all needed to mulch the trees it shall be allowed to lie on the ground. No hay to be taken from plot.

Plot 4, Rows J, K, L: Sod fertilized. To be kept in grass continually and mulched. The grass to be mowed and used for mulch. If sufficient grass does not grow for mulch additional material must be brought in. To be mowed once or twice a year. If grass is not all needed for mulch it shall be left on ground where it falls.

Kind of fertilizer and date of application to be determined later.

KEY TO VARIETY APPLE PLOTS

Row M—	1-2	Maiden Blush
	3-4	Maiden Blush
	5-6	Ohio Nonpareil
	7-8	Bellflower
	9-10	R. I. Greening
	11-12	York Imperial
	13-14	Stark
Row N—	1-2	Fameuse
	3-4	Magnate
	5-6	Henry Clay
	7-8	Albemarle Pippin
	9-10	Fanny
	11-12	Champion
	13-14	Lowery
Row O—	1-2	Red Rome Beauty
	3-4	Rome
	5-6	Wilson Red June
	7-8	McMahon
	9-10	Ortley
	11-12	Banana
	13-14	Jonathan
Row P—	1-2	N. W. Greening
	3-4	Giant Genition
	5-6	Ingram
	7-8	King David
	9-10	Via
	11-12	Loy
	13-14	Kinnard
Row Q—	1-2	Dudley
	3-4	Family
	5-6	Walter Pease
	7-8	Williams Favorite
	9-10	Arkansas
	11-12	Jeffries
	13-14	Gravenstein
Row R—	1-2	Black Ben Davis
	3-4	Northern Spy
	5-6	Winesap
	7-8	Liveland Raspberry
	9-10	Paragon
	11-12	Senator
	13-14	Stayman
Row S—	1-2	R. I. Greening
	3-4	Baldwin
	5-6	Banana
	7-8	Yellow Transparent
	9-10	York Imperial
	11-12	King David
	13-14	Delicious
Row T—	1-2	Maiden Blush
Row U—		
Row V—		

Rows W and X—White Pippin to be grafted

BULLETIN

OF THE

Ohio Agricultural Experiment Station

NUMBER 323 MAY, 1918

COUNTY EXPERIMENT FARMS IN OHIO

PART VIII

THE BELMONT COUNTY EXPERIMENT FARM

FIRST ANNUAL REPORT, FOR 1917

C. W. MONTGOMERY, CHIEF

JOHN J. LENTZ, FOREMAN

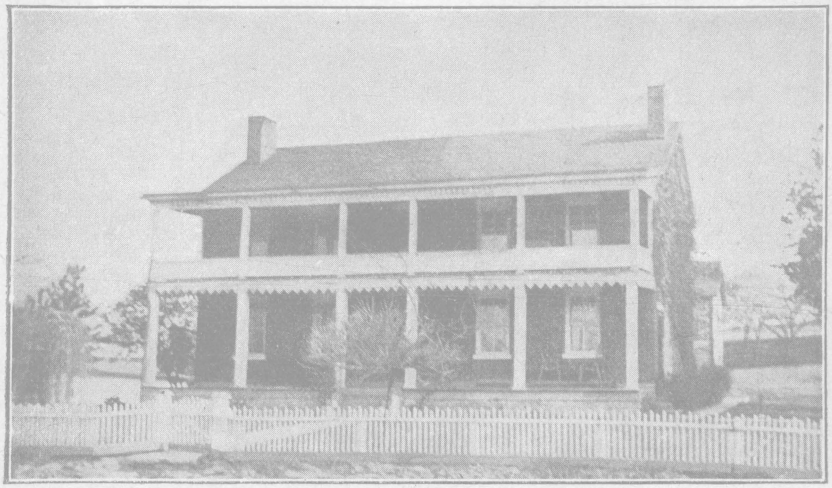
PERSONNEL

On the organization of the farm John J. Lentz was appointed foreman, and the management of the farm has been conducted from the office of the Department of Farm Management of the Experiment Station.

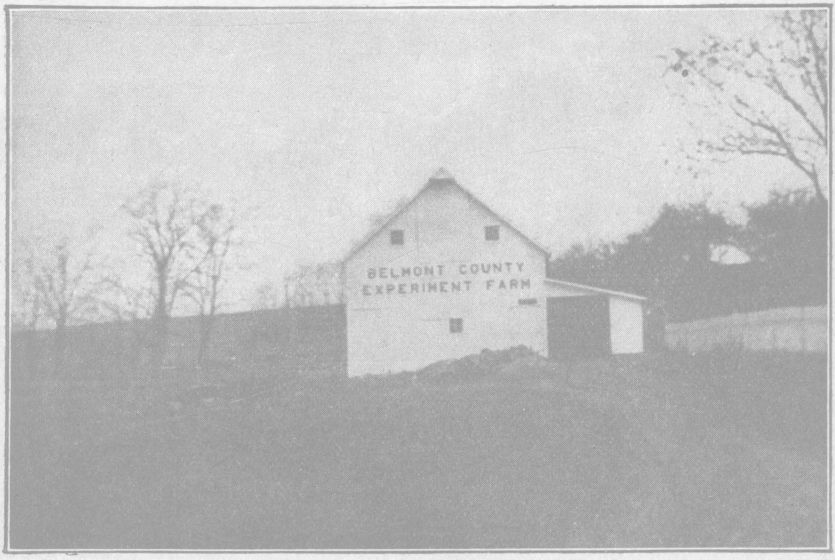
ORGANIZATION

The Belmont County Experiment Farm was authorized by an election held in November, 1910, but owing to litigation the farm was not located until the spring of 1917, when the County Commissioners and the Board of Control of the Experiment Station agreed on the purchase of a farm of 169 acres, 4 miles west of St. Clairsville, on the National Road.

On May 2 the Board of Control of the Experiment Station met with the Belmont County Agricultural Society and the following general plan of management for the County Experiment Farm was submitted by Director Thorne and approved by the Agricultural Society.



Residence, Belmont County Experiment Farm



Horse barn, Belmont County Experiment Farm

PLAN OF MANAGEMENT

Belmont County lies over the coal measures, and practically every farm is underlaid with valuable beds of coal, only a small part of which is as yet being mined. In the majority of cases, however, the coal has been sold. The western part of the county may be classed as rolling to hilly, while the eastern portion is very hilly and broken.

Excepting a few small areas of alluvium in the river and creek valleys the soils of the county have been formed by the decomposition of the underlying rocks. These consist of alternate horizontal layers of limestone and sandstone, out of which the torrential streams, originating at the foot of the ancient glaciers, have carved the present hills and valleys of the county. In the subsequent clothing of the hillsides with soil there has been considerable commingling of material from the two classes of rocks, due to the material carried down the hillsides by rain, although a noticeable feature of the hillsides of Belmont County is their relative immunity from gullying, an immunity largely due to the considerable amount of carbonate of lime in the soil, which has encouraged the growth of pasture grasses. There is no better protection of the soil from washing than a bluegrass sod.

The farm statistics of Belmont County show a decrease in the land in farms, both total and improved, during the 40 years, 1870 to 1910; an increase in the number of farms, with a decrease in the average size, and a decrease for 30 years in the total value of the average farm, which is overcome during the last decade.

The yield of the cereal crops has been maintained for 60 years at an average level of 37.5 bushels of corn, 23.4 bushels of oats, and 12.1 bushels of wheat per acre, but there has been a reduction in the area given to each of these crops during the last 30 years, so that there has been a considerable falling off in total production. This reduction in area has been in part due to the growth of the towns and in part to an increase in the land given to the hay crops.

Taken in connection with the reduction in livestock and the growth of the cities in and near the county, with the consequent increase in demand for hay for city horses, these statistics indicate a shifting of base from a system of agriculture in which a large part of the produce of the farm is fed on the farm to one in which both grain and hay are sold off the farm.

The livestock of Belmont County has rapidly fallen off, from an equivalent of 186 cattle to 1,000 acres of improved land for the 30

years, 1860 to 1889, 111 cattle per 1,000 acres for 1900 to 1909, a loss equivalent to 75 cattle per 1,000 acres or to 19,000 cattle for the county. The manure produced by this number of cattle would contain approximately the following constituents annually:

Nitrogen	1,900,000 pounds
Phosphorus	475,000 pounds
Potassium	1,500,000 pounds

The feed which would have produced this manure is now sold off the farms of the county, and in its place the following expenditures for fertilizers have been made annually during the last 30 years:

Annual cost of fertilizers and approximate composition

Decade	Quantity	Annual cost of fertilizers	Approximate composition		
			Nitrogen	Phosphorus	Potassium
	Tons	*Dollars*	*Pounds*	*Pounds*	*Pounds*
1880-89	*330	8,110	6,600	29,000	13,000
1890-99	713	16,837	14,000	63,000	28,000
1900-09	901	19,311	18,000	79,000	36,000

*Estimated.

The composition above given is estimated on the assumption that the average fertilizers used may have carried approximately the equivalent of 1 percent nitrogen (or 1.25 percent ammonia), 4.4 percent phosphorus (or 10 percent phosphoric acid) and 1 percent potassium (or 1.25 percent potash). This estimated composition is probably considerably above the actual composition of the fertilizer used, but upon this estimate the fertilizers purchased during the first 10-year period have restored less than 10 percent of the nitrogen carried out of the county in the crops sold; less than 20 percent of the phosphorus and about 12 percent of the potassium.

The present average crop yields of Belmont County are too low to yield a satisfactory income to the farmer, and there is no reason to believe that even these low yields will be maintained under the present system of agriculture.

FARM STATISTICS

The following statistics respecting the farms of Belmont County are compiled from the reports of the United States Census. The livestock and crop statistics are computed by 10-year averages from the statistics collected by the township assessors:

BELMONT COUNTY STATISTICS

POPULATION (U. S. Census)

Census year ☞	1860	1870	1880	1890	1900	1910
Total	.....	39,714	49,638	57,413	60,875	76,856
White	.....	38,406	48,007	55,477	59,006	75,070
Negro	.....	1,307	1,631	1,932	1,857	1,782
Foreign born	.....	2,614	3,128	4,415	4,591	11,575
Rural	.....	.....	.....	.....	35,519	46,570
Urban	.....	.....	.....	.....	25,356	30,286

Population, 1910: .

FARMS (U. S. Census)

FARMS: U. S. CENSUS	1880	1890	1900	1910
Approximate land area ..... Acres.	.....	.....	.....	339,200
Land in farms ..... Acres..	342,312	324,863	327,450	318,728
Improved land in farms ..... Acres..	264,762	258,892	267,625	254,513
Woodland in farms ..... Acres..	70,853	65,971	59.825	40,038
Other unimproved land in farms ..... Acres..	6,697			24,177
Total number of farms ..... Number..	3,252	3,580	3,839	3,780
Area of average farm ..... Acres..	99.9	90.7	85.3	84.3
Improved land per farm ..... Acres..	80.1	72.3	69.7	67.3
Value of all property per farm ..... Dollars..	5,168	4,410	3,377	5,106
Value of land and buildings per farm ..... Dollars..	4,611	3,832	2,869	4,399
Value of land and buildings per acre ..... Dollars..	46.20	42.25	33.63	52.18

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses ..... Number .	10,528	11,135	11,098	9,701	9,807	5,655
Cattle ..... Number..	21,225	20,387	21,505	22,087	20,020	15,634
Sheep ..... Number	64,659	144,317	143,458	148,461	93,399	63,385
Hogs ..... Number..	30,607	23,761	22,811	17,612	12,956	7,314
Cattle equivalent* { Total	.....	.....	49,230	48,395	40,462	28,359
Cattle equivalent* { Per 1000 Acres	.....	.....	186	187	151	111

FARM CROPS: 10-year average production (Ohio statistics)

Decennium	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn ..... acres..	27,702	25,268	27,708	24,919	23,631	19,862
Bushels..	951,517	912,925	1,129,729	997,615	864,478	945,803
Bushels per acre..	34.3	36.1	40.7	40.0	36.5	37.5
Oats ..... acres..	17,336	16,483	14,548	10,035	8,591	8,971
Bushels..	353,252	417,676	346,586	262,240	173,458	222,081
Bushels per acre..	20.4	25.3	23.8	26.1	20.2	24.8
Wheat ..... acres..	34,209	20,347	20,284	24,931	24,418	16,289
Bushels..	411,257	209,323	234,419	322,345	323,493	207,824
Bushels per acre..	12.2	10.2	11.5	12.9	13.2	12.7
Rye ..... acres..	1,396	1,178	520	178	425	185
Bushels..	9,000	12,096	4,908	1,683	4,444	1,857
Bushels per acre..	6.4	10.3	9.4	9.4	10.4	10.0
Meadows ..... acres..	19,949	22,041	25,681	32,999	35,138	38,792
Tons..	22,630	25,862	25,104	36,447	35,710	39,257
Tons per acre..	1.26	1.17	.98	1.11	1.02	1.01
Clover ..... acres..	.....	3,589	2,561	1,871	2,714	2,112
Tons..	.....	2,913	2,271	2,061	3,212	2,338
Tons per acre..	.....	.81	.89	1.10	1.18	1.11
Potatoes ..... acres..	.....	9.72	1,171	1,365	1,362	1,026
Bushels..	.....	87,461	103,455	129,553	99,240	99,186
Bushels per acre..	.....	90.0	88.3	94.9	72.9	96.7
Orchards ..... acres..	.....	5 594	6 508	6,279	6 355	5,162
Apples ..... bushels..	.....	.....				

*Computing ten head of hogs or sheep equivalent to one cow or horse in manure production.

While there has been a considerable reduction in the total number of domestic animals, there has been a steady increase in the number of dairy cows, this class of livestock taking the place of sheep and other animals, the total number of cows found in the county by the U. S. Census enumerators, who have generally been able to find more farm property than the township assessors, has been 9,466 in 1880; 10,796 in 1890; 11,822 in 1900 and 13,369 in 1910. When compared with the growth of the county in human population, however, we find that in 1880 there were 191 cows for 1,000 people; in 1890, 188; in 1900, 194, and in 1910, 174. The rapid increase in the urban population living in or near the county has caused a large demand for milk and this demand is likely to increase.

The production of milk, therefore, has become a leading feature of the agriculture of the county; and since the economical production of milk is dependent upon abundant pasturage, and since there is no method by which the wasting of hillside land can be so effectually prevented as by keeping it clothed with grass, it would seem that a study of methods for the improvement of pastures in connection with studies of the feeding and other problems concerned in milk production should be given the foremost place in the work of the county experiment farm.

It is therefore proposed to stock the farm with a herd of Jersey cows, beginning preferably with 2-year-old heifers, and to institute experiments in the production of feed and milk and in the improvement of pastures, both temporary and permanent, as the leading work of the farm.

Next to this work in importance in Belmont County would seem to be the production of orchard fruits, and the endeavor will be made to assist in reviving the once prosperous orchard industry of the county by demonstrations in the production and care of orchards, made upon the experiment farm and in orchards in other parts of the county whose owners may be willing to cooperate in the work.

The sheep industry should not be permitted to become extinct in Belmont County, as there is no industry so appropriate to hilly lands which are remote from transportation as the production of wool and mutton. The dog menace, which now operates as a discouragement to this industry will not always be endured. But the size and resources of the Belmont County Experiment Farm are not sufficient to carry on both dairying and sheep husbandry on a sufficient scale to do justice to both, and it seems better to confine its

work chiefly to one or the other. Dairying has therefore been selected as the industry suited to the location and conditions of the farm.

Sheep husbandry is being provided for on the Washington County Experiment Farm, and on the district experiment farm at Carpenter, Meigs County, so that the Belmont County farmer whose interest lies chiefly in this line of work will not be left entirely without the help of work carried on under conditions of soil and climate very similar to his own.

Another line of meat production which might well engage the attention of many Belmont County farmers is that of swine husbandry. A combination of forage and grain crops to be consumed on the field might be arranged that would reduce the labor of the farmer and would be well adapted to remote fields or farms. It is proposed to demonstrate this point in a small way on the Belmont County Experiment Farm.

It is also proposed to conduct experiments with poultry, with special reference to the production of both eggs and meat.

Approved:

G. E. Jobe, Pres. Board of Control
Chas. E. Thorne, Director

By E. N. Boggs,
Pres. Belmont Co. Agr. Society

J. J. Lentz,
Act. Sec. Belmont Co. Agr. Society

THE WORK OF THE YEAR

DEPARTMENT OF FARM MANAGEMENT

Work of reorganizing the farm for experimental purposes was begun March 1. Owing to the scarcity of labor and high price of material and labor, not as much progress was made during the year as was first contemplated. The following are the permanent improvements and repairs made and their cost:

COST OF PERMANENT IMPROVEMENTS, 1917

Tile drainage:			
Material—250 feet 3-in. tile at 2½c	$ 6.25		
360 feet 4-in. tile at 3½c	12.60	$18.85	
Labor		20.00	$38.85
Remodeling horse barn:			
Concrete floor 28 ft. by 45 ft. on 14 in. fill:			
Material	$183.55		
Labor	105.80	$289.35	
Repairing building.			
Material	69.05		
Labor	47.95	117.00	$406.35
Construction of Marietta silo 12 ft. by 30 ft:			
Material	$293.48		
Labor	82.50		$375.98
Wagon scale—Howe 4-ton champion:			
Material		$119.00	
Labor		44.33	$163.33
Fencing:			
Material		$ 42.83	
Labor		20.75	$ 63.58
Orchards:			
Material		$147.65	
Labor		165.15	*$312.80
Total permanent improvement			$1,360.89
Painting and repairing foreman's dwelling:			
Material	$60.35		
Labor	96.40		
Concrete steps and walk to road	41.75	$198.50	
Painting and repairing laborer's dwellings:			
Material	$91.95		
Labor	56.10	$148.05	
Painting and lettering barns:			
Material	$60.80		
Labor	62.40	$123.20	
Total maintenance repairs			$469.75
Total permanent improvement and repairs			$1,830.64

*Includes ground limestone and fertilizer, $36 20 and labor, $31.40, total $67.60 expended in first season's care of trees.

FINANCIAL SUMMARY

Inventory of Permanent Investment Costs and Operating Equipment March 1, 1918

Land, 169 acres—original cost, with buildings	$14,299.00	
Expense incident to purchase	31.50	
Accrued taxes	53.59	
		$14,384.09
Cost of permanent improvements and repairs*		1,830.64
Total cost, land and improvemets		$16,214.73
Operating equipment:		
Livestock—5 horses $775; 21 dairy heifers $1,000; 5 hogs$160	$1,935.00	
Implements, tools and harness	757.25	
Crops, feeds, etc.—corn $500; oats $115; wheat $16; hay $160; alfalfa $10; silage $350; cottonseed and oilmeal $12.10; tankage $17; straw $30	1,210.10	
Seeds—soybeans $30; timothy $90; alfalfa, etc. $71	191.00	
Fertilizers—limestone $62.50; nitrate soda $15; potash $5; acid phosphate $60; bonemeal $16.50	159.00	
Building materials—lumber $15; cement $10; white lead $3	28.00	
Fence material—posts $25; barbed wire $5	30.00	
Spray materials	1.75	
Sundries—hog houses $10; containers $6	16.00	
Total operating equipment		$ 4,328.10
Total investment		$20,542.83

*The repairs for this year are properly classed as part of the necessary equipment of the farm.

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1918

RECEIPTS

From county treasurer (balance after farm was paid for)	$6,393.28
From farm sales:	
Corn $134.13; hay $93.40; lime $38.95; rent of cow pasture $14; service fees $3	283.48
Total receipts	$6,676.76

EXPENDITURES

For labor			$1,636.98
For current expense—office supplies $6.03; telephone, telegraph and postage $27.09; harness, etc. $185.70; lime $97.20; fertilizers $191.14; seeds $149.30; containers $7.38; spray materials $8.35; hog crates, etc. $3.40; feed $244.96; veterinary services $15; miscellaneous hardware $6.95; plot fixtures $3.75			946.25
For permanent improvements:			
Drainage	$19.47		
Fence	60.17		
Buildings—material and construction	$521.82		
Concrete and masonry	304.06		
Painting	469.60		
		$1,265.48	
Water system		51.11	
Orchard trees		14.76	
General improvements		9.30	
			$1,420.29
For machinery and tools:			
Purchases $876.09; repairs and renewals $16.54			892.63
For livestock—5 horses $765; 5 hogs $102.70; 21 dairy heifers $849*			1,716.70
Total expenditures			$6,612.85
Balance in county treasury February 28, 1918			50.91
In hands of superintendent for payment of small bills			13.00
			$6,676.76

*Thirteen registered and eight grade Jersey heifers ranging in age from 6 months to 2 years of age have been purchased at a cost of $849. But one of these heifers is bred, the intention being to breed the heifers during the summer of 1918.

CROP AND LABOR STATISTICS OF THE BELMONT COUNTY EXPERIMENT FARMS FOR 1917

Area of farm, 169 acres

Crop	Number of plots	Total area	Total yield	Yield per acre
PLOT WORK		*Acres*		
Corn	20	1.67	8,950 lbs.	76.56 bu.
Oats	10	.67	1,075 lbs.	50.14 bu.
Soybeans	9	.6	444 lbs.	12.33 bu.
Cowpeas (hay)	1	.06	345 lbs.	2.41 tons
Total plots and plot acres	40	3.00		
FIELD WORK				
Corn (grain)		16.5	700 bu.	
(silage*)		7.	60 tons	
Oats		8.	10048 lbs.	
Hay:				
Clover and timothy		10.	25,945 lbs.	
Alfalfa (2 cuttings)		1.	3,300 lbs.	
Total field crops†		42.5		

	Corn	Oats	Soybeans
	Bu.	*Bu.*	*Bu.*
Highest yielding plots per acre	90.	62.34	14.06
Lowest yielding plots per acre	34.28	17.25	6.

Number work horses used on Belmont County Experiment Farm in 1917 4
Number man hours for the year (March 1, 1917 to February 28, 1918, inclusive) 6,850
Number horse hours for the year (March 1, 1917 to February 28, 1918, inclusive) 2 335

*Cost of filling silo:

Cutting ensilage (cutter, engine and two men to operate) 15 hours at $1.65	$24.75
Cutting, loading and hauling corn:	
175 man hours at 30c	52.50
120 horse hours at 10c	12.00
Boarding:	
27 meals at 35c per meal	9.45
Total labor cost of 60 tons ensilage (from seven acres)	$98.70
Labor cost per ton	1.65

†The farm has not been surveyed and some field crop areas and yields are estimated.

PASTURE EXPERIMENTS

It was thought that the pastures might be improved in some places by plowing and seeding to alfalfa, or by seeding to a mixture of grasses, these pastures to be consumed by hogs. Accordingly about an acre of land was sown to alfalfa. The alfalfa started nicely but grasshoppers destroyed portions of it. Another area of 2 or more acres was sown to a mixture of grasses at the rate per acre of 4 pounds each of alfalfa, red and alsike clover. The grass seeding did not make a good showing and will be repeated next March.

For studying methods of improving pastures some plots were laid out south of pike and treated as follows: Numbering from east, Plot 1, phosphated manure at the rate of 8 tons per acre and 1 ton of ground limestone, seeded.* Plot 2, plowed and fertilized at the rate per acre of 100 pounds of nitrate of soda, 200 pounds of acid phosphate, 50 pounds of muriate of potash and 1 ton of ground limestone, seeded.* Plot 3, disked and treated as Plot 2. Plot 4, check. Plot 5, 320 pounds of acid phosphate. Plot 6, 150 pounds of nitrate of soda. Plot 7, 1 ton of ground limestone. Plot 8, 100 pounds of nitrate of soda, 200 pounds of acid phosphate and 50 pounds of muriate of potash. Plot 9, check.

These plots are duplicated. A stand of grass was not obtained and the seeding will be repeated in the spring.

The plots will be clipped in June and August each year and along side some pasture will be left unclipped.

EXPERIMENTS IN THE MAINTENANCE OF SOIL FERTILITY

Because of the hilly topography of the greater part of Belmont County it seems desirable to keep the land in grass as much of the time as practicable, to avoid the washing which follows when hillsides are plowed. By referring to the table of farm statistics, given on page 459, it will be seen that this practice is in conformity with the general experience of the farmers of the county, the area in the cereal crops having steadily diminished during the 60-year period covered by these statistics, while that in meadows has as steadily increased. A 5-year rotation has therefore been adopted in which corn and wheat, each grown one season, will be followed by three years of clover and timothy, thus requiring but one plowing in the 5 years of the rotation.

Similar rotations, in which timothy is allowed to occupy the land for an even longer period, and too often without any manuring

*Grass mixture same as previously given.

or fertilizing except that given to one of the grain crops, have caused the opinion that timothy is a particularly exhaustive crop. It seems well, therefore, to study the effect of fertilizing and manure on the timothy crop itself and through this crop on the general rotation. An experiment has therefore been planned in which the fertilizing materials are to be distributed as shown in Table 91.

TABLE 91.—Plan of fertilizing in 5-year rotation of corn, wheat, clover, timothy and timothy, Belmont County Experiment Farm

Plot No.	Fertilizing materials: pounds per acre for entire rotation	Distribution of fertilizers—pounds per acre				
		Corn	Wheat	Clover	Timothy	Timothy
1	None					
2	Acid phosphate, 600 lb	200	200		200	
3	Acid phosphate, 600 lb Muriate of potash, 48 lb	200 16	200 16		200 16	
4	None					
5	Acid phosphate, 600 lb Muriate of potash, 48 lb Nitrate of soda, 120 lb	200 16 40	200 16 40		200 16	 40
6	Acid phosphate, 600 lb Muriate of potash, 48 lb Nitrate of soda, 120 lb Ground limestone, 2 tons	200 16 40 2 tons	200 16 40		200 16	 40
7	None					
8	Manure, 10 tons	5 tons			5 tons	
9	Manure, 10 tons Acid phosphate, 400 lb	5 tons 200			5 tons 200	
10	None					

The only crop as yet harvested in this test has been the corn crop of 1917, the outcome of which is shown in Table 92.

TABLE 92—Fertilizers, lime and manure on CORN. Belmont County Experiment Farm

Plot No.	Treatment per acre on corn	Yield per acre		Increase per acre	
		Grain *Bu.*	Stover *Lb.*	Grain *Bu.*	Stover *Lb.*
1	None	77.14	5,800		
2	Acid phosphate, 200 lb	90.00	6,500	11.43	967
3	Acid phosphate, 200 lb.; muriate potash, 16 lb	88.57	6,000	8.57	733
4	None	81.43	5,000		
5	Acid phos., 200 lb.; mur. potash, 16 lb.; nitrate soda, 40 lb.	78.57	5,700	1.90	467
6	Acid phos., 200 lb.; mur. pot. 16 lb.; nit. soda, 40 lb.; ground limestone, 2 tons	84.29	5,000	12.39	—467
7	None	67.14	5,700		
8	Manure, untreated, 10 tons;	84.29	6,100	13.34	700
9	Manure, untreated, 10 tons; acid phos., 200 lb	82.26	5,800	8.10	700
10	None	78.57	4 800		
	Average unfertilized yield	76.07	5 375		

While the treatment has generally increased the yield the large unfertilized yield and the soil irregularity usually experienced in a first experiment prevent drawing any definite conclusions.

COMPARISON OF VARIETIES

CORN

Seven varieties of corn were tested in 1917. The Leaming is first in yield, Darke County Mammoth, second, and Cook's 75, third.

OATS

Six varieties of oats were tested. The Ohio 6203 is first in yield, Big Four, second, and Silver Mine, third. Barley, as usual, is considerably below oats in yield. The yield of spring wheat is also very low, but this is accounted for in part by injury to the plot.

SOYBEANS

Six varieties of soybeans and one of cowpeas were tested. The Elton is first in yield, Ohio 9016, second and Medium Green, third.

TABLE 93—Comparison of varieties of CEREALS and SOYBEANS; Belmont County Experiment Farm

Variety	Yield per acre	
	Grain *Bu.*	Stover or Straw *Lb.*
Corn		
Dark County Mammoth	76.07	4,800
Leaming	82.51	4,650
Cook's 75	75.36	4,875
Ohio 84	59.64	4,200
White Cap	53.21	4,050
L. W. Hays (Local)	68.93	4,850
Clarage	69.64	4,200
Oats, wheat and barley		
Ohio 7009	45.89	1,590
Ohio 6203	60.55	2,610
Ohio 6222	55.06	2,925
Big Four	59.14	2,715
Silver Mine	58.90	2,505
Wideawake	54.22	2,565
Blue Ribbon spring wheat	*7.50	2,025
Oderbrucker barley	†20.00	2,055
Soybeans		
Ohio 900	12.00	3,300
Elton	15.75	2,790
Ebony	10.42	2,835
Ohio 9035	5.59	5,265
Ohio 9016	‡13.00	3,705
Medium Green	12.75	2,704
New Era cowpeas	§	5,175

*Defective stand.
†Lodged.
‡Ripened by frost.
§Frosted; not threshed.

BULLETIN

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COUNTY EXPERIMENT FARMS IN OHIO

PART IX

THE MADISON COUNTY EXPERIMENT FARM

FIRST ANNUAL REPORT, FOR 1917

C. W. MONTGOMERY, CHIEF

S. C. HARTMAN AND F. M. LUTTS, SUPERINTENDENTS
H. W. ROGERS, FOREMAN

PERSONNEL

S. C. Hartman superintended the work of this farm until July 1, 1917, when he was transferred to Washington County and was succeeded by F. M. Lutts, who resigned February 28, 1918.

Adah Bertha Coover

ADAH BERTHA COOVER
1860-1915

Adah Bertha Coover, daughter of Allison Jerome and Harriet Porter Coover, was born November 13, 1860, at the Coover farm home situated near the Springfield road, three and one-half miles from London, Madison County, Ohio.

During her earlier school years Miss Coover attended the country school of her home neighborhood, where she was noted for her diligence in study and rapid advancement as a pupil. At the age of thirteen years and six months, having passed the teachers' examination, the Madison County Board of Examiners granted her a certificate to teach common school.

In 1876 the Coover family moved to the town of London, where Miss Coover entered the high school and graduated with first honors in 1878. She was the first pupil of the London high school to take both classical and scientific courses.

For one year after graduation she taught in her home high school. Her purpose was to take a college course, but ill health of her mother decided her to abandon the plan. Instead she began the study of photography and for a time was assistant in an art studio in London.

Miss Coover, in addition to maintaining an interest in and study of literature, art and music, early developed a great love for and faith in her home town. She was a young person of high ideals and was ever thoughtfully devising and actively supporting plans for civic and community betterment. With no desire to become a "society" woman, in the generally accepted meaning of the word, she nevertheless enjoyed many of the social functions of her home city and vicinity. With rare gifts of mind and sweetness of disposition she became widely known, was highly esteemed and had a very great number of friends.

Being possessed of ample means financially she was enabled to travel quite extensively both in America and Europe; and wherever her widely diversified interests led her, she was active in ministering to the needs of humanity. However, regarding her charitable work, she declared: "While I may be fairly charitable, my generosity largely consists in helping others to help themselves rather than in outright giving."

Miss Coover's early girlhood having been spent at a farm home, she was not only deeply concerned with the interests and problems of rural life, but was an ardent lover and student of nature. Relating to such interests she wrote substantially as follows: "I have

found the world fraught with intense interest. I have no patience with a person who finds it dull or dreary. To me it is fascinating—exciting. How magnificently beautiful it all is—trees, flowers, birds, streams, people! If the next world is as lovely I shall be satisfied. But we are promised more than this."

Among her friends Miss Coover was considered an optimist. No matter how difficult or unpromising the situation, she was always hopeful and cheerful. Ever an enthusiastic student, she found the school of life an institution of surpassing interest—human nature its most fascinating study; and to her each new day brought its promise of better things to come.

Miss Coover was an untiring worker for the cause of temperance, hence the broad field for activity of the Woman's Christian Temperance Union appealed strongly to her. She also was an earnest, constant supporter of the cause of political advancement for women. The educational interests of her home town were ever a matter of much moment to her, in recognition of which, in 1895, she was elected a member of the London Board of Education, the first woman to be honored with such an office in her home town. She was also an active member of many women's organizations, a number of which it is possible to name as follows:

Woman's Christian Temperance Union
White Ribbon Army
Good Templars
Ohio Society of Daughters of 1812
Daughters of the American Revolution
Daughters of Rebecca
State Federation of Women's Clubs
North Side Literary Club
Fortnightly Civic Club
Farmers' Club and
Farmers' Institute Committee

Miss Coover was frequently sought as a speaker at various conventions. She was an occasional speaker at farmers' institutes and was active in the musical features of such meetings. In farmers' institute work she was, indeed, much interested; for she expressed her realization that the material welfare of her family and of most of the people of Madison County largely depended on agriculture.

Following an illness extending over several months, Adah Bertha Coover passed away at her home on East High Street, London, Ohio, February 5, 1915.

Miss Coover left a will by which, among other charitable bequests, the farm which had been her girlhood home was left to Madison County to be used as an experiment farm.

ORGANIZATION OF THE MADISON COUNTY EXPERIMENT FARM

In February, 1917, the County Commissioners of Madison County notified the Board of Control of the Ohio Agricultural Experiment Station that by will of Adah Bertha Coover a farm had been left to the county for experimental purposes and that it was the wish of the County Commissioners that it be operated as a County Experiment Farm. This farm consisted of 166 acres on the Springfield pike, four miles west of London.

As there was no suitable residence on the farm in which a foreman could reside and as the land needed tiling and the barn remodeling, the Board of Control asked that a levy of $5,000 be made for permanent improvements, and on the promise of the County Commissioners to make this levy the farm was taken over by the Board of Control.

On May 1, 1917, the Board of Control met with the Madison County Agricultural Society and the following plan of work for the Madison County Experiment Farm was submitted by Director Thorne and adopted.

PROPOSED PLAN OF MANAGEMENT

Madison County lies over limestones, of the Lower Helderberg or Waterlime series, but the foundation rock has been covered with a thick sheet of glacial drift in which are occasional deposits of gravel and sand. The surface of the county is flat to gently rolling, practically none of the land being too rough for cultivation.

The soils of the county have been formed from the decomposition of the drift and consist chiefly of the grayish yellow or light grayish brown Miami silt loam, and the darker, grayish brown to black, Clyde clay loam, which are associated with each other over a large part of western Ohio, the darker soils occupying the lower areas. There are small areas of alluvium along the streams, but the streams are small and their valleys narrow. In some cases underlying beds of gravel have given natural drainage, but over a large part of the county artificial drainage is the necessary first step towards soil improvement.

At an early date in the settlement of the State the open woodlands of this county, with bluegrass growing under the trees, attracted the attention of a class of men accustomed to the grazing of cattle, and numerous large farms were established, chiefly by immigrants from Virginia, with the production of beef cattle as the leading pursuit, and Madison County became known as the home of some of the finest herds of Shorthorn cattle in America. The general

interest in cattle production in this county is manifested in the cattle sales, which have been held at London on the first Monday of each month for half a century, and which are patronized by buyers and sellers from this and the neighboring counties.

The livestock statistics show, however, that there has been a large reduction in the number of cattle and sheep in this county during the last 30 years, the reduction in sheep being here, as elsewhere, relatively greater than that of cattle.

The statistics of crop production show that a relatively large proportion of the cultivated area of Madison County has been given to corn, this crop, previous to 1880, occupying more than five times as many acres as oats and wheat combined. Notwithstanding the continuous cropping thus indicated, the yield of corn per acre increased until the end of the century, but since then there has been a slight retrograde movement. During the eighties the area in wheat was trebled and since that period the combined area in wheat and oats has been about half that in corn.

Madison County has made a small beginning in the use of commercial fertilizers, the amount purchased annually during the last decade being sufficient to give each acre of wheat less than 30 pounds, or much less total fertilizing substance than would be found in one ton of manure. But the loss in potential manure production in Madison County during the last 30 years amounts to the equivalent of more than 2 tons of manure for each acre of wheat grown during the last decade, counting only the manure that would have been produced during the winter months, while the total winter production of manure during this period has not been enough to furnish 2 tons for each acre of corn and wheat.

FARM STATISTICS

The accompanying statistics respecting the population, farms and farm products of Madison County are compiled from the reports of the United States Census.

The size of the average farm in Madison County, 156.3 acres, is larger than in any other county of the State, the next in size being the adjoining counties of Fayette, with 135 acres, and Pickaway, with 134.6 acres. Moreover, the average size of farms in Madison County has increased during the last 40 years, whereas, over the State at large the size of the farms has been decreasing, the average area for 1910 being 88.6 acres.

MADISON COUNTY STATISTICS

POPULATION (U. S. Census)

	1870	1880	1890	1900	1910
Total	15,633	20,129	20,057	20,590	19,902
White	14,928	19,046	19,107	19,615	19,155
Negro	705	1,083	947	973	745
Foreign born	1,344	1,292	941	947	402
Rural	.....	.....	.....	17,079	16,372
Urban	.....	.....	.....	3,511	3,530

Population 1911: London 3,530; Mount Sterling 1,071; West Jefferson 1,043; Plain City 1,407, (Madison & Union)

FARMS (U. S: Census)

	1880	1890	1900	1910
Approximate land area.....Acres..	.....	.....	.....	318,080
Land in farms.....Acres..	289,326	271,282	294,353	286,586
Improved land in farm.....Acres..	244,526	236,487	256,006	263,825
Woodland in farms.....Acres..	43,700	} 34,795	38,347	{ 18,724
Other unimproved land in farm.....Acres..	1,090	}		{ 4,037
Total number of farms.....Number..	2,377	1,903	1,928	1,833
Area of average farm.....Acres..	121.7	142.6	152.7	156.3
Improved land per farm.....Acres..	102.9	124.2	132.8	143.9
Value of all property per farm.....Dollars..	6,101	7,543	8,659	15,294
Value of land and buildings per farm.....Dollars..	5,217	6,502	7,557	13,494
Value of land and buildings per acre.....Dollars..	42.87	45.60	49.49	86.33

LIVESTOCK: Ten-year average numbers (Ohio statistics)

	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Horses.....Number..	5,479	7,246	7,659	8,337	9,665	8,074
Cattle.....Number..	23,230	18,607	19,878	22,003	17,216	18,191
Sheep.....Number..	64,763	108,410	77,804	72,100	44,801	17,136
Hogs.....Number..	24874	27,059	37,586	32,174	30,406	31,922
Cattle equivalent { Total.....	37,673	39,400	39,076	40,767	34,402	31,171
Cattle equivalent { Per 1,000 acres..			159	172	134	118

FARM CROPS: 10-year average production (Ohio statistics)

Decennium	1850-59	1860-69	1870-79	1880-89	1890-99	1900-09
Corn.....acres.	27,963	38,167	61,177	60,184	71,761	74,852
Buhsels.	1,009,518	1,378,520	2,284,435	2,254,681	2,835,460	2,771,245
Bushels per acre.	36.1	38.1	37.3	37.4	39.4	37.0
Oats.....acres..	1,748	2,752	2,509	3,261	5,279	24,563
Bushels..	22,562	65,500	65,138	77,358	140,620	663,577
Bushels per acre.	12.9	23.8	25.9	23.7	26.7	26.9
Wheat.....acres..	6,421	6,640	10,595	26,008	32,504	18,662
Bushels..	78,833	71,498	134,395	360,532	501,407	220,559
Bushels per acre..	12.3	10.8	12.7	13.9	15.4	11.8
Rye.....acres..	693.5	863	709	2,282	506	959
Bushels.	6,713	9,504	8,794	29,994	4,991	9,849
Bushels per acre..	9.7	11.0	12.4	13.1	9.9	10.3
Meadows.....acres..	11,395	13,947	12,963	16,885	15,291	14,359
Tons.	11,937	15,807	16,288	19,727	17,617	15,542
Tons per acre..	1.05	1.13	1.25	1.17	1.15	1.07
Clover.....acres..	.....	425	703	3,090	6,196	8,691
Tons..	.....	378	477	2,943	6,283	8,370
Tons per acre..	.....	.89	.68	.89	1.01	.96
Potatoes.....acres .	.....	333	420	524	376	218
Bushels	....	22,995	27,221	40,555	25,208	18,244
Bushels per acre..	.....	69.0	64.8	77.4	67.0	83.6
Orchards.....acres..	.....	1,405	2,009	1,798	1,429	921
Apples.....bushels..	.....	35,937	62,494	50,535	26,273	17,415

These statistics show that there is a general trend in Madison County towards an increase in the area given to the cereal crops and a decrease in the number of farm animals, while there has not been sufficient purchase of commercial fertilizers to offset the loss in manure. In view of these facts and of the further fact that the labor conditions in Ohio are making it each year more and more necessary to devise methods for reducing the labor requirements of the farm, it is proposed to separate the experiment farm into two divisions, one to be operated as a livestock farm and the other as a grain farm, with experiments designed to discover what treatment is required to maintain the fertility of the land under both systems of management and with the least expenditure of labor.

The experiment farm is well adapted to this plan of treatment. It contains 166 acres, or just 10 acres more than the average farm of the county. It lies in a long narrow tract which is crossed near the middle by the Big Four railway. The buildings are on the part north of the railway and here is where the livestock work can be located to the best advantage, after setting off a small area for woodland, orchard and garden work, while the south side of the farm is remote from the buildings but relatively convenient to the shipping station at Florence, on the Pennsylvania railway. The following general plan of management is therefore proposed:

PROPOSED PLAN OF MANAGEMENT

After setting off a few acres for woodland, orchard, buildings and small-plot work, it is proposed to divide the farm into two nearly equal portions,and to manage one of them as a farm on which all the produce excepting wheat will be converted into meat and the other as one from which the produce will all be sold.

For such a small farm as this it would seem that the winter feeding of beef cattle should be the main object of the livestock division, such feeding to include experiments designed to throw light on such questions as economy as well as greater effectiveness in the use of feeds.

In the treatment of both divisions it would seem that under present labor conditions methods for economizing labor in the production and disposal of crops should receive a large share of attention, and in both, of course, measures for the maintenance of soil fertility must have a leading place. To this end experiments with manure and fertilizers will be instituted, which will be so planned as to articulate with those in progress at the Main Station and at other experiment farms, while a few features which seem to be especially appropriate to Madison County conditions will be added.

Variety testing and seed production.—A series of plots will be set apart for the testing of varieties of corn and wheat and some of the most promising sorts will be grown in field culture in the grain farming division in order to produce improved seed for distribution.

Orchard and garden work.—As these interests are relatively of minor importance in Madison County the attention given them will be limited to the planting and care of a small orchard and garden, such as should be found on every farm.

Forestry.—The present woodlot on the experiment farm contains a number of oaks which are mature and should be harvested to make room for a new growth. There is also a fine grove of young trees which will be carefully saved.

Drainage.—The first essential to successful management of this farm is underdrainage, to secure which an outlet in the form of a county ditch will be necessary. An undrained farm may yield a livelihood, but when the purpose of the farm is to contrast different methods of management uniformity in drainage is indispensable.

Buildings and roads.—A 6- or 7-room dwelling near the north entrance of the farm for the residence of the farm foreman, a feeding shed or barn, a farm office attached either to this barn or to the dwelling, the repair of the old farm house and a gravelled road leading from this house and barn, where the teams will be kept, to the front entrance, are permanent improvements that will be absolutely necessary.

Approved May 1, 1917:

P. M. Gregg
Berthier Lohr
Geo. Fitzgerald
} Board of County Commissioners
Madison County, Ohio

Marion Sanford, President
Lamar P. Wilson, Secretary
} Madison County
Agricultural Society

G. E. Jobe, President Board of Control,
Chas. E. Thorne, Director,
Ohio Agricultural Experiment Station.

WORK OF THE YEAR

On March 1, 1917, work of reorganizing the farm for experimental purposes was begun. S. C. Hartman was appointed superintendent and H. W. Rogers, foreman. On July 1 Mr. Hartman was transferred to Washington County and Mr. F. M. Lutts succeeded him as superintendent.

As the farm had been in cultivated crops for a number of years it was thought advisable to sow most of the land to oats and sow clover seed in the oats. Two hundred pounds of acid phosphate was applied to the land and a local variety of oats sown. On about one acre of land Sixty-day oats was sown not only to note the difference in yield but also to note the effect on the stand of clover, the Sixty-day oats coming off the land several days ahead of the other variety. A good crop of oats was harvested and on most of the land a full stand of clover was obtained. In the field two varieties of corn, Leaming and Clarage, were planted, and 200 pounds of acid phosphate per acre was applied. The land on which the Clarage variety was planted was probably not as fertile as that on which the Leaming was planted and the Leaming gave the better yield.

The beginning of experiments in soil fertility was deferred in order to drain the land.

Soybeans were sown and observations were made as to benefits of inoculation. It could not be noted that inoculation was of any benefit.

A small farm orchard of 40 apple trees was put out.

Such forest trees as the Department of Forestry deemed advisable to spare were sold for the sum of $1,166.28.

On examination it was found that the old farm residence could not be repaired so as to make a habitable house at a reasonable expense, and the building of a 5-room house with cellar was contracted for, to cost $1,616.

The crops grown and harvested and financial statement will be found in the following tables.

RECEIPTS AND EXPENDITURES

For the year ending February 28, 1918

RECEIPTS

From county treasury:		
Balance in treasury March 1, 1917	$2,218.85	
Collection past due rent, September 17, 1917	459.35	
		$2,678.20
From farm sales:		
Livestock—1 horse	$ 172.50	
Crops:		
Cereal—corn $115.81; oats $966.88	1,082.69	
Roughage—straw $116.55; corn fodder $45.38	161.93	
Truck—(from tenant's garden and truck patch) potatoes $17.00; tomatoes $10.13; cabbage $3.00; sweet corn $1.90	32.03	
Fruit—apples	1.00	
Lumber—on the stump	1,166.28	
		$2,616.43
Total receipts		$5,294.63

EXPENDITURES

For labor		$1,095.84
For current expense—office maintenance $48.47; communication $22.05; harness, etc. $69.80; horse shoeing, etc. $13.05; freights on mules and harness $11.74; feed $162.32; bedding $2.60; veterinary service $3.50; fertilizers $260.27; seed $408.09; containers $17.60; binding material $19.30; threshing, etc. $97.87; miscellaneous hardware $1.49; tenant's truck $62.40		1,200.55
For machinery and tools—purchases $583.59; repairs, etc. $10.16		593.75
For permanent improvement:		
Drainage—freight and incidental for ditcher	$ 37.91	
Fence	21.00	
Buildings—material and construction	1,567.76	
		$1,626.67
For livestock—2 horses		405.00
Total expenditures		$4,921.81
Balance in county treasury February 28, 1918		372.82
		$5,294.63

FINANCIAL SUMMARY

Inventory of Permanent Investment Costs and Operating Equipment

Land—167 acres bequeathed to county valued at $125 per acre, including buildings*		$20,875.00
Permanent improvements:		
Building—laborer's house, erected 1917	$1,675.00	
Orchard—40 apple trees set 1917†	16.00	
Total permanent improvements		11,691.00
Total permanent investment		$22,566.00
Operating equipment:		
Livestock—mare and foal	$ 155.00	
Machinery, tools and harness	601.00	
Crops, etc.—hay $300; straw $6; corn $650; spring wheat $3; oats $800	1,759.00	
Seeds—soybeans $50; grass seed $80	130.00	
Fertilizer	10.00	
Fence	20.00	
Lumber	3.00	
Containers—bags	12.00	
Total operating equipment		2,686.00
Total investment		$25,252.00

*Original buildings: Barn No. 1, $600; granary and shed, $200.

†Cost of orchard: 40 apple trees at 15c, $6; planting and care, 40 hours at 25c, $10.

CROP AND LABOR STATISTICS FOR 1917

*Area of farm, 166 acres
Area of Farmstead 2 acres
Area cultivated, 137.5 acres
Permanent 9 acres
Woodland 2 acres
Roads (Public) 5 acres
Roads (Farm) 2.5 acres
Waste 2 acres

Crop	Number of plots	Total acres	Total yield	Yield per acre
PLOT WORK				
Corn	10	1	4,214 lbs.	60.2 bu.
Oats	10	1	1,738 lbs.	54.33 bu.
Soybeans	10	1	826 lbs.	13.76 bu.
Total plots and plot acres	30	3		
FIELD WORK				
Corn		36.5	97,510 lbs.†	38.16 bu.
Oats		78	116,448 lbs.	46.09 bu.
Soybean hay		2	6,000 lbs.†	1.5 tons
Timothy		14	24,000 lbs.†	.85 ton
Orchard		2	New	
Not croped		2		
Total plots and plot acres		134.5		

*All areas except total area of farm and plot work estimated.

†Estimated.

	Corn	Oats	Soybeans
	Bu.	*Bu.*	*Bu.*
Highest yielding plots per acre	80.72	60.47	18.83
Lowest yielding plots per acre	47.14	34.22	2.4

Number work horses used in 1917 3
Number man hours for the year (March 1, 1917 to February 28, 1918, inclusive) 3,170
Number horse hours for the year (March 1, 1917 to February 28, 1918, inclusive) 2,115

COMPARISON OF VARIETIES

Because the drainage of the land could not be completed in time no experiments with fertilizers were undertaken in 1917, but the following variety comparisons were made:

CORN

The testing of varieties on this farm began in 1917. Seven varieties of corn were tested with the following results: Darke County Mammoth is first in yield, Ohio 84, second, and Leaming, third.

OATS

Six varieties of oats were tested. The Silver Mine stands first, Ohio 6203, second, and Big Four, third.

The yield of barley in pounds per acre is less than three-fifths as much as the average of the six varieties of oats.

The yield of spring wheat is very good, but it should be remembered that the season was unusually favorable.

SOYBEANS

Six varieties of soybeans were tested. The Ohio 9100 is first in yield, Elton, second, and Ohio 9016, third. A light yield of New Era cowpeas was also secured.

TABLE 94—Comparison of varieties; Madison County Experiment Farm

	Yield per acre *Bu.*
Corn	
Dark County Mammoth	70.03
Leaming (P. D.)	62.47
Cook's 75	51.43
Ohio 84	63.38
White Cap	56.17
Yellow Leaming (Local)	61.60
Clarage	60.46
Oats	
Ohio 7009	58.73
Ohio 6203	59.59
Ohio 6222	54.51
Big Four	59.19
Silver mine	60.05
Wideawake	55.83
Oderbrucker Barley	22.81
Blue Ribbon spring wheat	24.17
Soybeans	
Ohio 9100	18.66
Elton	15.67
Ebony	13.78
Ohio 9035	12.06
Ohio 9016	15.29
Medium Green	14.67
New Era cowpeas	2.50

APPENDIX

SUMMARY OF EXPERIMENTS WITH FERTILIZERS AND VARIETIES OF GRAINS

Table 95 summarizes the experiments made on the different farms with acid phosphate used alone, or reinforced with muriate of potash and nitrate of soda, the value of increase, cost of treatment and net gain being computed on the basis of approximate values in the spring of 1918.

The table shows that acid phosphate has been used alone with a large profit in every case except on the Paulding County soil, but the reinforcement with muriate of potash, or with that and nitrate of soda has either reduced the profit or turned it into loss.

As the cost of potassium and nitrogen is less in these salts than in mixed fertilizers, at the prices usually demanded for such fertilizers, it follows that their purchase cannot be recommended.

The results of the variety tests are summarized in Table 96.

Of the eight different varieties of corn tested on the district and county experiment farms the Darke County Mammoth, Leaming and Clarage have given very general satisfaction, and under the most favorable conditions, also the Reid.

Among the different varieties of oats tested the Silver Mine, Ohio 6203, Big Four, Sixty Day and Ohio 6222 are in the lead.

Of the old standard varieties of wheat the Gypsy, Poole, Fultz, Valley and Mediterranean are among the best, while of the newer sorts, the Gladden, Trumbull and Portage have merit.

The most valuable varieties of soybeans are the Elton, Ebony, Ohio 9016, Ohio 9015 and Mongol.

TABLE 95.—SUMMARY OF EXPERIMENTS WITH FERTILIZERS

Station	Duration of test	Fertilizer per acre			Increase per acre				Annual value of increase[1]	Annual cost of fertilizers[2]	Annual net gain or loss (—)
		Acid phosphate	Muriate potash	Nitrate soda	Corn	Oats	Wheat	Hay			
	Yr.				*Bu.*	*Bu.*	*Bu.*	*Lb.*	*Doll.*	*Doll.*	*Doll.*
Acid phosphate alone											
Wooster	24	320	.....	.....	7 60	9.25	7.98	844	7.36	.77	6.59
Strongsville	23	320	.....	.....	7.54	9.70	8 00	1 020	7.69	.77	6.92
Germantown	14	240	.....	.....	7.05	.....	5 11	673	7.27	.96	6.31
Carpenter	14	240	.....	.....	8.41	.....	5.68	339	7.43	.96	6.47
Findlay	9	360	.....	.....	5.08	5 60	5.01	597	5.94	1.08	4.86
Miami Co.[4]	7	500	.....	.....	10.37	6.86	11.01	761	10.31	1.50	8.81
Paulding Co.[5]	6	500	.....	.....	—3.95	—2.77	.44	938	.27	1.50	—1.23
Clermont Co	6	500	.....	.....	3.43	[3]1.67	4.46	409	5.10	1.50	3.60
Hamilton Co	5	500	.....	.....	3.97	[3] .66	8.56	263	5.88	1.50	4.38
Washington Co	3	500	.....	.....	3.30	.....	1.19	776	3.83	1.50	2.33
Trumbull Co	2	500	.....	.....	3.25	.41	10.46	83	6.27	1.50	4.77
Mahoning Co.[6]	1	500	.....	.....	.....	8.38	[3]23.24	.....	.....	1.50	.....
Acid phosphate and muriate of potash											
Wooster	24	320	260	.....	15.55	12.72	9.31	1,515	11.01	13.77	—2.76
Strongsville	23	320	260	.....	9.47	9.88	9.07	884	8.33	13.77	—5.44
Germantown	14	240	40	.....	12.71	.....	6.86	809	10.83	4.29	6.54
Carpenter	14	240	40	.....	9.84	.....	7.39	563	9.61	4.29	5.32
Findlay	9	360	60	.....	8.46	4.66	5.87	905	7.62	4.83	2.79
Miami Co.[4]	7	500	90	.....	13.16	10.15	13.01	687	12.98	7.12	5.86
Paulding Co.[5]	6	500	90	.....	—4.97	—2.35	1.43	437	—.15	7.12	—7.27
Clermont Co	6	500	90	.....	10.43	[3]2.56	5.93	295	8.04	7.12	.92
Hamilton Co	5	500	90	.....	9.53	[3]1.49	9.92	470	9.41	7.12	2.29
Washington Co	3	500	90	.....	1.99	.....	2.51	626	3.90	7.12	—3.22
Trumbull Co	2	500	90	.....	6.35	5.13	11.41	424	9.05	7.12	1.93
Mahoning Co.[6]	1	500	90	.....	.....	6.46	[3]23.37	.....	.....	7.12	.....
Acid phosphate, muriate of potash and nitrate of soda											
Wooster	24	320	260	480	19.41	19.02	16.35	2,380	16.84	18.57	—1.73
Strongsville	23	320	260	480	11.26	14.45	11.60	1,144	10.77	18.57	—7.80
Germantown	14	240	40	160	14.03	.....	9.61	749	12.96	6.96	6.00
Carpenter	14	240	40	160	12.79	.....	10.49	753	13.14	6.96	6.18
Findlay	9	360	60	240	6.62	5.36	5.26	559	6.33	7.83	—1.50
Miami Co.[4]	7	500	90	160	11.10	9.76	14.15	497	12.61	9.12	3.49
Paulding Co.[5]	6	500	90	160	.23	.64	6.01	292	5.21	9.12	—3.91
Clermont Co	6	500	90	160	16.51	[3]3.28	10.44	645	13.01	9.12	3.89
Hamilton Co	5	500	90	160	7.41	[3]1.66	9.88	689	9.33	9.12	.21
Washington Co	3	500	90	160	5.60	.....	7.10	898	8.84	9.12	— .28
Trumbull Co	2	500	90	160	2.48	9.12	10.12	525	7.80	9.12	1.32
Mahoning Co.[6]	1	500	90	160	.....	6.40	[3]27.41	.....	.....	9.12	.....

[1]Valuations: Corn, $1 per bu.; oats, 75c per bu.; soybeans, $3 per bu.; hay, $15 per ton
[2]Valuations: Acid phosphate, $24 per ton; muriate of potash, 25c per lb.; nitrate of soda, 5c per lb.
[3]Soybeans.
[4]Average of 4 duplicate tests with corn and 2 with wheat.
[5]Average of 2 duplicate tests.
[6]Average of 3 duplicate tests.

TABLE 96, Part I.—SUMMARY OF VARIETY TESTS

Leading varieties of cereals and soybeans at the experiment farms. Average yields in bushels per acre

Crop and variety	Wooster	German-town	Car-penter	Han-cock	Pauld-ing	Miami	Cler-mont	Hamil-ton	Wash-ington	Trum-bull	Mahon-ing	Madi-son	Belmont
CORN	12 yrs.	11 yrs.	12 yrs.	6 yrs.	5 yrs.	5 yrs.	5 yrs.	5 yrs.	4 yrs.	2 yrs.		1 yr.	1 yr.
Darke County Mammoth	69.0	69.6	61.7	58.8	59.9	61.6	28.3	54.6	54.7	.....	.....	70.0	76.1
Leaming	72.7	65.7	55.6[11]	62.5	61.0	57.3	27.4	46.9	49.9	67.0	.....	62.5	82.5
Cook's 75	67.5[8]	.....	.....	60.2	63.1	59.3	25.8	52.8	.....	.....	.....	51.4	75.4
Ohio 84 (Early Reid)	64.8	60.8[10]	51.7[9]	58.3	57.7	53.7	.....	43.8	51.6	70.5	.....	63.4	59.6
Boone County White	71.4[8]	66.8	53.6[11]	65.1	.....	63.9	.....	.....	.....	.....	.....	.....	.....
Clarage	66.3	60.5	50.1	55.0	61.9	57.5	26 4	56.0	51.8	65.8	.....	60.5	69.6
White Cap	64.4	.....	.....	45.8	52.9	55.9	23.0	44.1	.....	64.9	.....	56.2	53.2
Reid (Orcutt)	77.6[10]	.....	.....	.....	60.1	59.3	28.9	52.2	.. ..	.....	.....	.....	.....
OATS, BARLEY AND EMMER	13 yrs.		5 yrs.	7 yrs.	6 yrs.	6 yrs.	5 yrs.	5 yrs.		3 yrs.	2 yrs.	1 yr.	1 yr.
Big Four	68.1	.....	.....	45.0	58.4	63.6	27.8	49.3	.....	47.2	43.9	59.2	59.1
Silver Mine	68.3	.....	.....	45.9	57.5	59.8	26.1	49.9	.....	51.0	44.0	60.0	58.9
Swedish Select	59.2	.....	.....	43.3	54.2	58.8	22.5	40.7	.....	46.1	39.1	.....	.....
Sixty Day	68.6	.....	32 8	41.1	53.6	61.2	28.5	43.6	.. ..	42.5	32.9	58.7	45.9
Ohio 6203	69.6[7]	.....	28.8	45.2	58.1	62.6	25.5	40.5	.. ..	49.7	46.3	59.6	60.5
Ohio 6222	66.5[7]	.....	.....	47.3	61.2	62.0	22 9	44.3	.....	45.9	48.3	54.5	55.0
Wideawake	58.5	.....	26.6	40.0	51.2	58.3	20.0	43 6	....	46.4	38.4	55.8	54.0
Oderbrucker barley	32.5	.....	12.5	22.4	37.7	34.7	.....	24.2	.....	20.2	13.4	22.3	20.0
Emmer	32.9	.....	18.6	33.1	.....	36.1	.....	24.2	.....	25.6	20.3	.....	.....

Note: The small figures indicate the number of years the varieties have been tested.

TABLE 96, Part II.—SUMMARY OF VARIETY TESTS

Leading varieties of cereals and soybeans at the experiment farms. Average yields in bushels per acre

Crop and variety	Wooster	Germantown	Carpenter	Hancock	Paulding	Miami	Clermont	Hamilton	Washington	Trumbull	Mahoning	Madison	Belmont
WHEAT	10 yrs.	8 yrs.	8 yrs.	7 yrs.	4 yrs.	5 yrs.	4 yrs.	4 yrs.	2 yrs.	2 yrs.	1 yr.	1 yr.	1 yr.
Fulcaster	34.2	21.4	.....	18.8	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fultz	36.0	24.6	26.7	17.2	.....	32.3	.....	.....	.....	33.6	38.6	.....	.....
Trumbull	38.3	27.4	27.1	.....	36.8	36.4	.....	.....	15.6	32.6	34.0	.....	.....
Ohio 8106	36.8	.....	.....	.....	.....	33.0	.....	25.8	.....	.....	.....	.....	.....
Poole	36.7	27.0	27.3	18.5	.....	33.4	.....	.....	.....	32.8	28.6	.....	.....
Portage	39.7	29.4	30.8	.....	33.6	35.8	14.0	26.2	.....	33.2	31.3	.....	.....
Gypsy	35.2	27.6	27.5	19.2	.....	35.6	.....	.....	.....	.....	33.9	.....	.....
Gladden	39.0	28.6	29.0[7]	.....	36.7	37.0	15.9	32.1	22.6	36.9	36.6	.....	.....
Mediterranean	34.0	21.7	27.2	20.3	28.4	34.3	13.9	28.4	23.0	.....	.....	.....	.....
Rudy	35.9	22.5	25.7	.....	31.6	35.3	11.8	.....	.....	.....	.....	.....	.....
Turkey Red	29.2	20.0	23.7	16.2	34.4	32.0	9.9	28.5	.....	.....	.....	.....	.....
Valley	36.0	22.6	27.4	.....	.....	36.0	.....	.....	.....	37.1	32.7	.....	.....
Goens	36.2[5]	.....	.....	.....	28.7	35.4	.....	26.5	.....	29.3	25.4	.....	.....
Nigger	36.4	24.1	27.5	18.1	34.5	34.6	15.8	25.7	22.6	31.4	30.9	.....	.....
Dawson's Golden Chaff	39.9	22.2	.....	20.4	.....	.....	.....	.....	.....	34.2	27.3	.....	.....
Red Wave	37.9	.....	.....	.....	.....	.....	.....	28.5	13.2	32.4	28.9	.....	.....
Velvet Chaff	32.5	23.5	25.4	15.9	31.9	33.4	13.8	27.2	17.1	31.4	27.1	.....	.....
Spring wheat	17.2[8]	.....	.....	.....	.....	.....	.....	.....	.....	14.7	11.6	24.2	7.5
SOYBEANS	6 yrs.				3 yrs.	5 yrs.	3 yrs.	5 yrs.	2 yrs.	3 yrs.	1 yr.	1 yr.	1 yr.
Ohio 9100	20.6	.....	.....	.....	17.9	17.6	3.9	13.2	15.0	16.4	6.5	18.7	12.0
Ebony	24.5	.....	.....	.....	18.1	20.6	6.0	18.1	12.2	18.0	8.0	13.8	10.4
Elton	27.2	.....	.....	.....	22.4	21.3	6.3	14.0	15.8	14.2	3.4	15.7	15.7
Mongol	24.0	.....	.....	.....	17.4	20.7	8.5	18.3	14.7	.....	6.7	.....	.....
Ohio 9035	24.5	.....	.....	.....	22.4	19.2	6.3	17.8	16.7	.....	.....	12.1	5.6
Ohio 7496	28.0	.....	.....	.....	17.5	18.8	.....	14.9	.....	.....	1.6	.....	.....
Ohio 9016	28.8	.....	.....	.....	17.5	17.8	.....	12.9	.....	9.8	1.2	15.3	13.0
Medium Green	24.3	.....	.....	.....	13.7	17.7	5.4	12.1	10.4	13.9	7.4	14.7	12.7
New Era cowpeas	7.5[3]	.....	.....	.....	00.0	6.3	0.9	4.7	1.6	00.0	0.0	2.5	00.0

Note: The small figures indicate the number of years the varieties have been tested.